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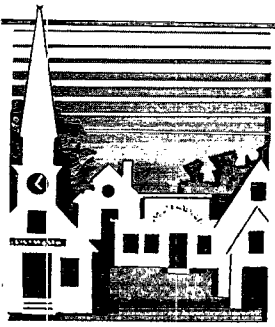
Getting Out From Under



underground storage tank alternatives for small towns

National Association of
Towns and Townships

Getting Out From Under

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National Center for Small Communities

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This guidebook is part of a training package that includes a video and facilitator's guide. It is one in a series of modules designed to improve the delivery of services to rural people through management training for small town officials.

This training package was funded by a grant from the W. K. Kellogg Foundation of Battle Creek, Mich.

This book has been reviewed by the U.S. Environmental Protection Agency's Office of Underground Storage Tanks in relation to Subtitle I of the Resource Conservation and Recovery Act (RCRA).

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introduction

how this guide will help

Underground storage tanks (USTs) are essential to the health and safety of small town America. The fuel they store enables fire, police and rescue vehicles to operate 24 hours a day. Access to motor fuel remains essential, especially if emergencies temporarily cut off power, water and/or telephone service. Across the country, thousands of small and rural governments own and operate USTs. Yet most local officials have never seen an underground storage tank and have little idea of the age or condition of those for which they are responsible.

This situation is changing rapidly. Environmental concerns, skyrocketing insurance costs, liability claims and new state and federal regulations have brought USTs to the forefront of local government issues. Leaking USTs are one of the nation's leading causes of groundwater contamination. They pose the greatest threat in rural America, where 95 percent of the population depends on well water for drinking. As a result, local governments face substantial costs to comply with regulations covering both the tanks themselves and potential cleanup.

Most small and rural governments are reluctant to close down their tanks. Too many services depend upon a home town fuel source that must be available when needed.

Frankly, the temptation for many local leaders is to do nothing. When the subject is raised, the following responses are typical:

"Can't do without 'em, can't afford to replace 'em."

"That tank has been down there for 20 years. We'd know if there was a major leak."

"The state regulators sent our township a notice in 1988, but they haven't started fining us yet."

Recent surveys by the U.S. Environmental Protection Agency (EPA), however, argue strongly for immediate action. The following figures suggest why many experts describe USTs as "ticking time bombs":

- 25 percent or more of the nation's two million USTs may already be leaking;
- cleanup costs can run up to several million dollars. In 1990, correcting the average spill or leak cost over $50,000; and
- 80 percent or more of the USTs in small towns are made of unprotected steel; these tanks are prone to leaking after as little as 10 years in the ground.

The combination of mandates and potential liability has taken many local leaders by surprise. Strict federal and state regulations governing most publicly owned USTs require local governments to:

- test their tanks regularly for leaks and control for spills;
- clean up any damage that leaks and spills have caused;
- replace or upgrade their tanks to meet minimum design standards;
- prevent leaks and spills in the future; and
- provide adequate means to finance all cleanup costs and liability claims related to faulty USTs.

In complying with the regulations, local officials must consider a range of options before deciding to upgrade, replace or close down community storage tanks.

Before spending local dollars on services or equipment, elected officials are accustomed to weighing the

costs and benefits of the choices available. The lower initial cost of used equipment, for instance, may be offset by a shorter useful life and by higher expenditures for operations and maintenance. In addition to costs and benefits, however, decisions involving underground storage tanks must consider an entirely new dimension: the potential liabilities associated with leaks and spills.

To deal with the chance of catastrophic liability, more and more small town leaders are turning to an approach called risk management. This problem-solving technique enables local governments to identify areas where they are vulnerable and then to take steps to limit their exposure, or liability.

Risk management is particularly well-suited for dealing with underground storage tanks, since leaks are so expensive to clean up and liability costs may be virtually unlimited. The approach utilized in this guidebook identifies various alternatives that can reduce and even remove your community's liability for USTs. Its goal is to make the reader a "well-educated consumer," able to deal knowledgeably with the experts who are likely to be involved in the design and construction of a town or township's fuel supply system. Local leaders never find it easy to decide where to spend scarce local dollars. But a risk management approach to USTs can help you determine what your community must spend today in order to avoid potentially disastrous cleanup and liability costs tomorrow.

New UST systems which meet all compliance standards offer maximum protection against leaks and spills. But many small and rural governments cannot afford these state-of-the-art systems. They must rely on upgrading the tanks and piping they already have or on finding another source of fuel altogether. Using a risk management approach to solve their UST problems will enable local leaders to balance acceptable risks with available funds.

Getting Out From Under includes a summary of federal UST standards, work sheets to provide cost estimates for alternative systems or fuel sources, guidelines for operations and maintenance procedures and criteria for choosing professional assistance.

The guidebook is based on two assumptions: first, local leaders must make a series of decisions based on both the community's needs and the condition of its USTs; and second, each decision should involve the maximum reduction in risk for the minimum number of dollars.

The guidebook is organized to follow the decision-making process:

- Problem identification—the introduction defines the problem and summarizes the risk management approach.
- Solutions—chapter 1 examines basic UST technologies and leak prevention, detection and correction techniques.
- Regulations—chapter 2 provides a summary of the regulations that apply to the tanks and piping, to general operating procedures and to financial responsibility requirements.
- Risks—chapter 3 examines risk management options, including closure and regionalization.
- Choices/Costs—chapter 4 calculates the various options in terms of capital costs, operating costs, corrective action and potential liability.
- Outside Help—chapter 5 discusses hiring outside help and sources of technical assistance and financial support.

Underground storage tanks represent a growing threat to many small towns' environmental and financial security. *Getting Out From Under* assumes that local officials will act decisively once they understand the potential liability posed by tanks whose condition may be unknown. While time and money will be involved, risk management is far less expensive than crisis management.

This guidebook, along with a video that focuses on real-life community case studies and a facilitator's guide for conducting training sessions, comprise a practical, hands-on training package that can help local officials analyze the range of solutions available to solve underground storage tank problems. Information on the purchase or rental of the training package is available through the National Association of Towns and Townships, 1522 K Street N.W., Washington, D.C. 20005, (202) 737-5200.

Fire, police and rescue vehicles must be able to operate in emergencies. Underground storage tank facilities should be located where accidents or natural disasters are least likely to close them down.

Photo by the American Red Cross

chapter 1

basic tank technology

Since the 1920s, millions of underground storage tanks have been installed at commercial, industrial, residential and governmental facilities. For years, these systems were not sophisticated in design, nor was much care given to installation and maintenance. The result was a significant number of leaks and spills of the stored material, particularly gasoline.

Independent sources document how extensive these leaks and spills have been. A 1986 study by the U. S. Environmental Protection Agency (EPA) indicated that approximately 35 percent of the 2,500 tanks and piping systems surveyed, whose average age was only 12 years, did not pass a tightness test. State UST regulatory agencies have reported similar findings.

What goes wrong and why?

It is clear that a significant proportion of all existing underground storage tank systems are leaking, and that more tanks will leak as their useful lives are exceeded. In addition, significant quantities of stored materials may be released into the environment during normal operations. Local leaders should have a basic knowledge of USTs in order to understand the problems that may already exist and the options available if tanks are to be upgraded or replaced. Later chapters will compare the costs and benefits of continuing to own and operate a UST with the use of alternative fuel supplies.

Leaks and spills are primarily the result of either system failure or human error. Chart 1 illustrates the basic components of a UST system (tank, piping and filling and dispensing equipment) as well as a number of the leak detection methods discussed later in the chapter.

The specific reasons for leaks and spills are:

- operational errors
- improper installation
- piping failures
- tank failures

By implementing preventive or corrective actions in each of these areas, local leaders can greatly reduce the liabilities associated with their USTs.

Operational errors. Filling and dispensing operations cause numerous releases from underground storage tank systems. Overfills are common for tank systems that lack overfill protection or cutoff devices. Similarly, operator errors periodically result in product losses during dispensing activities. For most facilities, the quantity of stored material lost due to operator error is relatively small. However, such losses may be frequent, and, over time, significant contamination of soil and/or groundwater can occur.

Improper installation. A large percentage of UST system leaks are the result of improper installation techniques. Tanks and piping are frequently damaged during transportation and installation. The use of inappropriate backfill materials can accelerate corrosion, and insufficient tightening of joints or fittings can result in leaks. Studies indicate that up to 10 percent of all newly installed tanks may have a leak somewhere in the system.

Piping failures. Four out of five leaks in UST systems occur in the piping, not in the tank itself. While corrosion appears to be a primary cause of such failures, piping leaks can also occur due to loose

fittings, improper sealing of pipe joints, differential settling of the tank and piping, stresses caused by freeze-thaw cycles, hydraulic shock and pump-induced vibrations, among other problems.

Tank failure. The most significant leaks are likely to occur due to tank failures. Frequently, steel tanks are prone to corrosion. Since corrosion is a natural electro-chemical process, any factor in the design or installation of a tank system that enhances this process can result in accelerated corrosion and premature tank failure. For instance, corrosion may be accelerated by the use of corrosive or non-homogeneous backfill, by the presence of shallow groundwater, by stray currents from electrical power sources or by the use of dissimilar metals in the tank and/or piping.

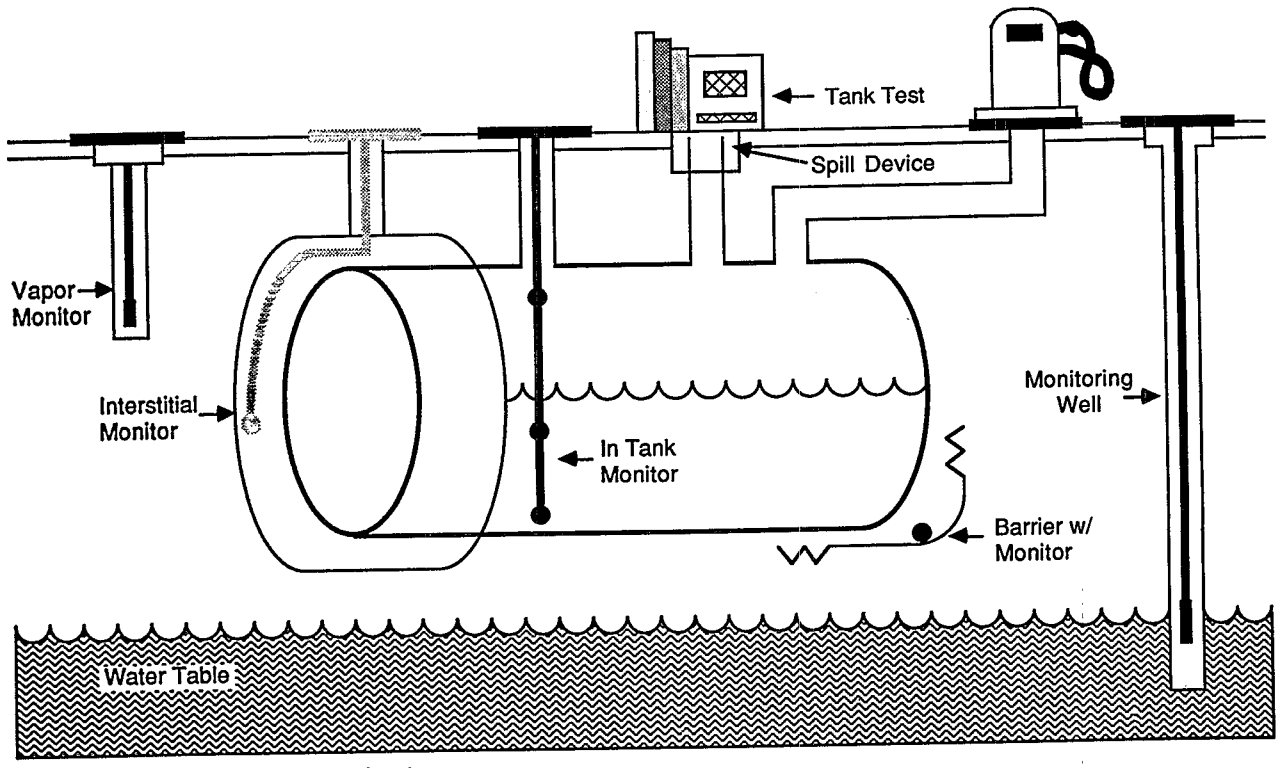
Fiberglass tanks, while not subject to corrosion, can fail due to their lack of inherent structural strength. These tanks are easily damaged during shipping and installation and can fail if they are not covered with backfill to the proper depth or if the foundation provided during installation is inadequate.

The USTs that most towns and townships own and operate are likely to suffer a disportionate number of leaks and spills. Most of these systems are 15 years old or older, are relatively small and/or are constructed of unprotected steel. In addition, the tanks would likely not meet today's stricter installation standards, and they often are operated by individuals with limited tank expertise. Each of these factors increases the possibility that these tanks are leaking now or are susceptible to future leaks or spills.

For many years, the cost of owning and operating a UST was minimal. But the necessity to comply with federal and state regulations has increased both the known costs for bringing a system into compliance and the unknown costs for cleanup and the liability associated with leaks and spills. The regulations require local governments to correct and/or prevent "what goes wrong" with the USTs they own and operate.

Some localities may decide to close down their USTs altogether if they can find alternative fuel sources. Towns and townships that choose to maintain one or more UST should be aware of the vastly improved technologies that offer considerably more protection than the first generation of bare steel tanks.

Chart 1



Source: U.S. Environmental Protection Agency

Improved tank technologies

Over the last five to 10 years, advances in tank technology have significantly reduced the probability of spills or leaks. Whether upgrading existing systems or purchasing new USTs, owners and operators can take advantage of the significant advances that have been made in:

- tank designs
- piping and fittings
- overfill prevention
- spill and leak containment
- leak and spill detection
- tank upgrading techniques
- soil and groundwater remediation techniques

Improved tank design. Historically, a large proportion of all underground tank installations consisted of bare steel tanks. These tanks were constructed of a single wall of carbon steel with no protective coatings, inside or out. Given the limited degree of environmental protection provided by bare steel tanks and the constraints imposed by recent federal and state UST regulations, the use of bare steel tanks has virtually ceased in recent years. Instead, a variety of improved tanks is available, including:

- coated steel tanks
- fiberglass-reinforced plastic tanks
- fiberglass-coated steel tanks
- double-walled tanks

A variety of materials can be utilized to coat the inside and/or outside of a bare steel tank. In this type of design, polyester or epoxy compounds are sprayed, brushed or rolled onto the tank surfaces, following their preparation to maximize adherence of the coating. The coatings are designed to provide increased levels of resistance to chemicals and/or corrosion.

Fiberglass or fiberglass-reinforced plastic (FRP) tanks designed for underground storage were introduced in 1960. Since FRP tanks do not have the inherent structural integrity of steel tanks, many of the earlier installations failed due to improper handling, inadequate depth of cover or excessive surface loadings. Due to the resistance of FRP to corrosion and its high degree of compatibility with many chemicals and petroleum products, however, manufacturers continued to improve FRP designs. Current FRP designs have been widely accepted due to improvements in structural integrity, increased attention to appropriate handling and installation and their ability to meet the federal regulatory requirements.

Also available are tanks which combine the corrosion resistance of fiberglass and the strength of steel. Fiberglass-coated steel tanks are constructed with an outer layer of FRP bonded to an inner layer of carbon steel. The inner layer provides structural support, while the outer layer provides protection from external corrosion.

Another technological innovation has been the development of double-walled tanks, consisting of internal and external tank shells of steel or fiberglass. These tanks typically incorporate a leak detection system designed to monitor either a vacuum or the presence of liquids in the space between the inner and outer walls. This method is called interstitial monitoring. Double-walled tanks provide a high degree of environmental protection, since it is easy to detect leaks into the tank through the outer wall or out of the inner tank into the interstitial space.

Improved piping and fittings. For many years, standard galvanized steel pipe has been used for most UST piping installations, but adverse conditions such as corrosion, excessive vibration and high traffic load have led to significant failure rates. A variety of alternative piping materials is currently available, including plastic, fiberglass-reinforced plastic, stainless steel and composite. Composite pipes typically consist of rubber, plastic or epoxy-lined steel pipes. In addition, there are now double-walled pipe designs, which consist of inner and outer walls and are similar in concept to double-walled tanks. All of these piping designs reduce the potential for leaks.

Pipe fittings and valves constitute another area in which improved designs have reduced the potential for spills and leaks. A wide variety of fittings and valves has been used in the past to join two or more pieces of the pipe, to change pipe direction or size and to control flow volume or direction. Many improved designs are now available, such as new fittings which counter pipe stresses due to expansion, contraction, vibration and pressure surges. Improved valve designs also prevent backflow of fluids from pipes and hoses during loading and dispensing operations.

Corrosion protection. As noted above, relatively few USTs installed before 1980 were designed with built-in corrosion protection, although corrosion protection technology had been used for many years to minimize damage to larger metal structures such as bridges and pipelines. When buried, many USTs act like batteries with corrosive electrical forces flowing from positively to negatively charged parts of the system. Two types of cathodic protection systems are now available for underground tanks and piping networks. Galvanic cathodic protection systems employ "sacrificial" anodes. When attached to the outside of USTs, these protruding pieces of metal act as underground lighting rods and sacrifice themselves to the corrosive forces conducted through the soil before the tank itself is damaged. The second type of protection, the impressed current system, utilizes a low-powered electric current. When continuously applied to the tank or piping, it offsets the corrosive currents generated by the tank itself.

Overfill prevention. Material transfers to and from underground storage tanks are a major source of releases to the environment. Such losses typically occur when stored materials are spilled, when transfer hoses are disconnected or when tank overfills occur. A variety of equipment can minimize the potential for such releases, including:

- sensors and gauges designed to detect liquid levels in the tank
- high level alarms
- automatic shut-down devices
- emergency overfill containment systems

- dry-disconnect couplings for transfer hoses and pipes

Spill and leak containment. Once spills and leaks have occurred, they can be contained in a number of ways. Containment systems can be located above or below ground and are designed to contain aboveground spills and/or leaks from tanks and piping. Aboveground systems include collection sumps located at transfer points and impervious diked areas designed to collect accidental spills. Belowground systems include clay or membrane liners installed beneath tanks and/or piping networks to prevent the migration of any released materials. In addition, underground tanks can be installed in accessible underground vaults, usually constructed of concrete, that permit visual inspection of the storage system for leaks and spills.

As closed areas, however, these installations present safety risks. Local fire codes may require costly electrical switches and ventilation equipment to reduce the chance of fire and explosion.

Leak and spill detection. Tank testing and leak detection have advanced rapidly over the last few years, and there are now approximately 25 techniques for detecting leaks in tanks and/or piping networks. Most of the testing methods measure changes in product volume or level over time to determine if a leak exists.

Some of these testing methods have been adapted for use in automatic inventory control systems. Such systems, when combined with specific information on the volume of deliveries and withdrawals, can provide continuous monitoring of potential leaks into or out of underground tank systems.

Just as some test methods are more suited to one type of tank system than another, a number of factors have a significant impact on the accuracy of the various testing methods. These include the size of the tank, the type of material being stored, temperature fluctuations during the test period, the presence of vapor pockets, expansion and contraction of the tank due to changes in tank volume and the skill of the test operators.

To provide some measure of acceptable performance, EPA regulations specify that each test method, variously known as a "precision leak test," "tank integrity test" or "tank tightness test," must be able to detect leaks as small as 0.1 gallon per hour with a 95 percent probability of detection and a 5 percent probability of false alarm. Even so, tanks meeting these standards could be leaking up to approximately 2.4 gallons per day.

Leak detection devices (other than those found in double-walled tanks) monitor leaks in the soil or water around the tank itself. These systems typically utilize thermal conductivity or electrical resistance techniques to measure changes in the soil environment (the presence of gasoline for example) beneath and/or adjacent to the tank system. If the stored materials are sufficiently volatile, vapor detection devices can also be utilized in concert with monitoring wells installed in or immediately adjacent to the tank excavation.

A variety of area-wide surveillance techniques can also detect leaks from tank and piping networks. The most common methods incorporate an array of groundwater or gas monitoring wells. The monitoring wells can be sampled periodically or equipped with automatic monitoring and alarm systems. Such systems provide documentation that a leak or spill has occurred and information on the extent of soil and/or groundwater contamination. Since clean up is so costly, it is best to prevent leaks rather than detect them after the fact.

Tank upgrading. The useful life of some existing tanks has been increased by repairing perforations

Most surface spills of petroleum and other stored products are the result of human error. Local governments can virtually eliminate these problems by training employees in proper filling and dispensing procedures and by installing spill and overflow devices.

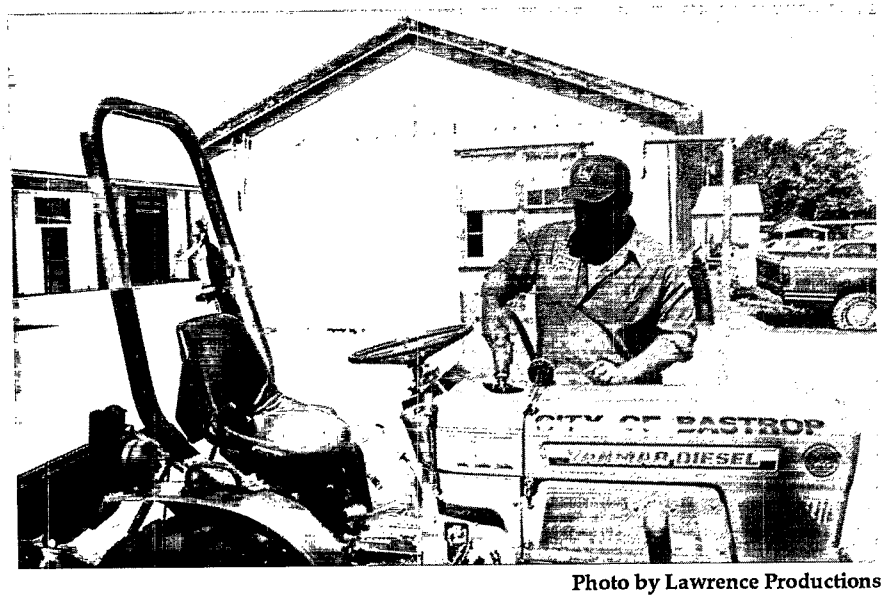


Photo by Lawrence Productions

through fiberglass repair techniques and/or the use of polyester or epoxy linings. The cost of lining the interior of an existing tank may save as much as 50 percent compared to the cost of replacement. In addition, many of the improvements used with new tanks (overfill prevention devices, spill containment devices, leak and spill detection devices, corrosion protection devices) can be used to upgrade existing tanks. But any initial savings achieved through upgrading must be weighed against the remaining useful life of the tank and the added reduction in risk that could be realized by replacing the tank altogether.

Improvements in remediation techniques. Federal and state UST regulations require the cleanup of all leaks and spills above a certain amount. Until recently, tank operators dealt with underground releases either by excavating to recover and treat the free product and contaminated soil or by using pumping techniques to recover the floating and dissolved product from the groundwater.

A much broader array of both site investigation and remediation techniques is currently available. Site investigation techniques now include surface geophysical methods that indirectly assess the extent of contamination in soil and/or groundwater. New technologies for remediating contaminated soil and/or groundwater, include:

- soil washing techniques
- petroleum degrading bacteria (bioremediation)
- improved groundwater pumping and treatment methods

Making a choice

It is clear that many choices confront local officials who wish to continue operating their USTs. By 1998, federal and state law require the installation of new or upgraded tanks and piping; spill and overflow prevention devices; and leak detection equipment. While the least-cost approach may be used to meet minimum compliance standards, the risk management approach looks at liability reduction, not just dollars saved. Certainly the technical options discussed above can help to reduce the risks associated with leaks and spills. But the costs and benefits of upgrading or replacing existing USTs must be weighed against other options, such as closing down existing tanks and purchasing fuel from an outside source. The following chapters bring together these issues of compliance, cost and risk reduction.

Photo by Lawrence Productions

Bastrop, La., has installed monitoring wells to detect leaks around its centralized municipal fuel facility. Storage tank specialist Bobby Herndon checks the water from the small monitoring wells regularly for any signs of contamination.

chapter 2

understanding the federal regulations

Motor fuel and many other liquid chemicals were originally stored above ground. The drawbacks soon became dangerously obvious. Vapor leaks caused explosions or poisonous fumes. Carelessly driven motor vehicles or delivery trucks ruptured tanks or piping. The tanks themselves took up much needed space at increasingly congested commercial sites and were subject to product theft or tampering.

As a result, wholesalers, retailers, businesses and governments buried their tanks and, hopefully, their problems. But in placing storage tanks underground, there was no way to predict how long they would last and what unseen problems might occur.

Operators of these newly buried storage tanks had some protection against underground leaks. Major losses could be discovered through delivery and dispensing records or through the use of a manual monitoring device such as a dipstick. But the detection of smaller underground leaks and the impact of routine surface spills were largely ignored.

In the 1960s and '70s, USTs were identified as the country's major source of groundwater contamination. Studies of in-ground tanks established that existing USTs had an expected useful life, after which a leak was almost inevitable. Corrosion, improper installation, faulty pipes and surface spills all contributed to the substantial entry of motor fuel and other harmful products into the environment. In both the public and private sectors, there was support for the regulation of underground storage tanks to protect human health and the environment.

After a number of states passed their own UST regulatory programs, Congress required the U.S. Environmental Protection Agency (EPA) to develop national standards for USTs under the 1984 amendments to the Resource Conservation and Recovery Act. An underground storage tank, according to the EPA definition, is "any tank, including underground piping connected to the tank, that has at least 10 percent of its volume under ground." (Towns and townships may operate a number of types of tanks which are exempt from federal, if not state and local, regulations. See box, p. 15.)

The federal regulations are divided into two broad categories, **technical standards** and **financial responsibility requirements**. EPA summarizes the technical standards for petroleum products as follows:

- all new UST systems must be protected from corrosion, equipped with spill and overfill prevention devices and provided with leak detection;
- existing UST systems must be provided with leak detection that is phased in over a five-year period, with the oldest tanks due in the first year (December 1989) and the youngest in the fifth year (December 1993);
- existing UST systems must be upgraded (essentially to the new tank standards) by 1998;
- all suspected releases must be investigated, and confirmed releases must satisfy corrective action requirements established on a site-by-site basis by the state; and
- requirements for reporting, record-keeping, operation and maintenance and closure must assure that the UST system does not leak or spill throughout its operating life.

Financial responsibility requirements call for UST owners and operators to demonstrate their financial capability to take prompt corrective action and/or to compensate third parties for injuries or damage due to leaks or spills from USTs. The regulations do not specifically require insurance, because local governments have available a number of other mechanisms to demonstrate their ability to pay for cleanup costs and liability claims.

This chapter will review EPA's technical and financial requirements, particularly as they relate to small town and rural elected officials. Some communities may have no choice but to own and operate USTs. For them, the regulations impose new and ongoing costs to meet the technical and financial responsibility requirements and to operate and maintain their tanks as long as they are in service. Local governments that have alternative fuel sources available should calculate the savings they would realize in transferring many of the following regulatory compliance responsibilities to another unit of government or to the private sector.

Many state and local authorities have enacted more stringent regulations than those established by the federal government. Before making any decisions, local leaders should obtain specific regulatory information from the appropriate state agency (listed in appendix d) and from local authorities with UST responsibilities. County regulations or local fire codes may include strict requirements on UST site location, storage of gasoline and other chemicals, type of tanks and so forth.

A major focus of the federal UST technical standards involves tanks and piping. New and existing tanks must meet requirements for:

- corrosion protection
- leak detection and monitoring systems
- spill and overflow devices

In addition, there are technical standards that cover tank management issues such as general operating procedures, tank closure and corrective action (cleanup of leaks and spills).

Federally unregulated tanks

The following tanks are not covered by federal UST regulations although they may be subject to state and/or local standards:

- farm and residential tanks holding 1,100 gallons or less of motor fuel used for noncommercial purposes
- tanks storing heating oil used on the premises where it is stored
- tanks on or above the floor of underground areas, such as basements or tunnels
- septic tanks and systems for collecting storm water and wastewater
- flow-through process tanks
- tanks holding 110 gallons or less
- emergency spill and overfill tanks

The vast majority of small local governments store only gasoline or diesel fuel in their underground storage tanks. But federal and state regulations also apply to the storage of many other chemical products, or "regulated substances." If your local government owns tanks which store other than petroleum products, you should check with state (or local) regulatory agencies for compliance guidelines.

Tank and piping requirements

The regulations for corrosion protection and leak detection can be broken down into two categories, those that apply to existing USTs and their piping systems and those that apply to all new tank systems. The terms and technologies referred to in the requirements are discussed in chapter 1.

For existing tanks and piping systems, there is a single deadline of December 22, 1998, to meet the **corrosion protection regulations**. The tank regulations require installation of a cathodic protection system or an interior lining, or both, by that date. The same deadline applies to piping, which must be made of either fiberglass or cathodically protected steel, with or without a non-corrosive coating.

In order for new tanks to comply with the corrosion protection requirements, they must be made of fiberglass, steel with an exterior fiberglass shell or coated steel with cathodic protection. New piping systems must be coated, cathodically protected steel or fiberglass. These requirements must be met by all tanks installed after December 1988.

Leak detection requirements also vary between existing and new tank systems. For existing tanks, compliance with the monthly monitoring requirement is determined by the age of the tank. For tanks installed before 1970, the deadline for leak detection has passed. For tanks installed between 1970 and 1974, an approved leak detection program must be in place by December 22, 1991. Tanks installed between 1975 and 1979 must have a program in place by December 22, 1992, and tanks installed between 1980 and 1988 must comply by December 22, 1993.

A tank leak detection program may comply through one of two approaches. The first is to perform monthly monitoring by means of:

- vapor monitoring
- interstitial monitoring
- automatic gauging
- groundwater monitoring
- other methods approved by EPA or the state regulatory agency

These methods operate on a continuous basis. At least once a month, the monitoring equipment is checked to determine whether a leak has occurred or is taking place. Many devices now include automatic or immediate warning systems which detect when a leak has occurred.

The second method involves both monthly inventory control and tank tightness testing at intervals determined by the age of the tank and method of corrosion protection used.

Chart 2 summarizes how long this method may be used for tanks installed before and after December 22, 1988. Many small and rural governments may rely on daily dipstick measurements and annual tank tightness tests to satisfy the release detection requirement. But this method can be used only until December 22, 1998, unless both corrosion and spill and overflow protection devices are added. Even with these improvements, local governments must add one of the monthly monitoring devices within 10 years to meet federal leak detection requirements.

The deadline for **leak detection compliance** for pressurized piping systems has already passed. These piping systems must use at least two separate methods of leak detection, due to the potential for serious releases inherent in the technology. Local governments can satisfy part of the requirement by using an automatic line leak detector, consisting of either an automatic flow shut-off or a continuous alarm system, or by using an automatic flow restrictor. In addition, the regulations require either monthly groundwater, vapor or interstitial monitoring or an annual test for line tightness. Suction piping requires any of the above monthly monitoring methods that are used for pressurized systems, or a line test every three years. The deadlines for meeting leak detection standards for suction piping are the same as those for leak detection on existing tanks. There are some exemptions if strict federal- or state-approved design standards are followed.

Spill and overflow protection is straightforward. Each new tank system must have catchment basins at potential spill or overflow sites, and one of the following must be used: an overfill alarm, a ball float valve or an automatic shut-off device. Existing systems must meet these standards by December 1998.

Enforcement of UST regulations varies from state to state. EPA employes a franchise model in delegating to the states responsibility for monitoring compliance. While EPA signs off on all aspects of a state's UST program, the agency allows considerable latitude in the area of enforcement. But the regulations do carry the force of law, and court cases and fines can result from non-compliance. Perhaps a greater incentive for meeting the regulations is a local government's responsibility for protecting public health and its desire to avoid the unnecessary liability that neglected tanks can cause.

Tank management procedures

The overall purposes of EPA's technical standards are the prevention of leaks and spills and the detection and correction of current or future environmental damage. Even the most advanced UST system depends on a comprehensive tank management program to maintain the level of protection for which it was designed. Federal and state requirements are quite specific in terms of records, reports, operations and maintenance and other management procedures. Many of these responsibilities may be handled at the UST site by municipal employees or by various contractors and suppliers. But while certain tasks can be delegated, local elected officials are responsible for compliance and and liable if leaks and spills occur. As a public manager responsible for USTs, you should have a basic understanding of how your community is meeting and documenting its compliance with these requirements.

The ability to answer the following questions is indicative of a good tank management program:

- Have UST authorities been notified of the status

Gasoline, kerosene and other petroleum products were originally stored in aboveground tanks. When storage tanks were buried to lower the risk of fire and explosion, little thought was given to the potential damage to soil and groundwater caused by undetected leaks.

Photo by Lawrence Productions

Chart 2

WHAT DO YOU HAVE TO DO? Minimum Requirements

You must have Leak Detection, Corrosion Protection, and Spill/Overfill Prevention.
For WHEN you have to add these to your tank system, see the chart on page 18.

LEAK DETECTION	
NEW TANKS ***2 Choices***	• Monthly Monitoring* • Monthly Inventory Control and Tank Tightness Testing Every 5 Years (You can only use this choice for 10 years after installation.)**
EXISTING TANKS ***3 Choices*** *The chart at the bottom of the next page displays these choices.*	• Monthly Monitoring* • Monthly Inventory Control and Annual Tank Tightness Testing (This choice can only be used until December 1998.) • Monthly Inventory Control and Tank Tightness Testing Every 5 Years (This choice can only be used for 10 years after adding corrosion protection and spill/overfill prevention or until December 1998, whichever date is later.)**
NEW & EXISTING PRESSURIZED PIPING ***Choice of one from each set***	• Automatic Flow Restrictor • Automatic Shutoff Device -and- • Continuous Alarm System • Annual Line Testing • Monthly Monitoring* (except automatic tank gauging)
NEW & EXISTING SUCTION PIPING ***3 Choices***	• Monthly Monitoring* (except automatic tank gauging) • Line Testing Every 3 Years • No Requirements (if the system has the characteristics described in the final regulations)
CORROSION PROTECTION	
NEW TANKS ***3 Choices***	• Coated and Cathodically Protected Steel • Fiberglass • Steel Tank clad with Fiberglass
EXISTING TANKS ***4 Choices***	• Same Options as for New Tanks • Add Cathodic Protection System • Interior Lining • Interior Lining and Cathodic Protection
NEW PIPING ***2 Choices***	• Coated and Cathodically Protected Steel • Fiberglass
EXISTING PIPING ***2 Choices***	• Same Options as for New Piping • Cathodically Protected Steel
SPILL / OVERFILL PREVENTION	
ALL TANKS	• Catchment Basins -and- • Automatic Shutoff Devices -or- • Overfill Alarms -or- • Ball Float Valves

* Monthly Monitoring includes: Automatic Tank Gauging, Vapor Monitoring, Interstitial Monitoring, Ground-Water Monitoring, Other Approved Methods

** Very small tanks may also be able to use manual tank gauging

Chart 2

WHEN DO YOU HAVE TO ACT? Important Deadlines

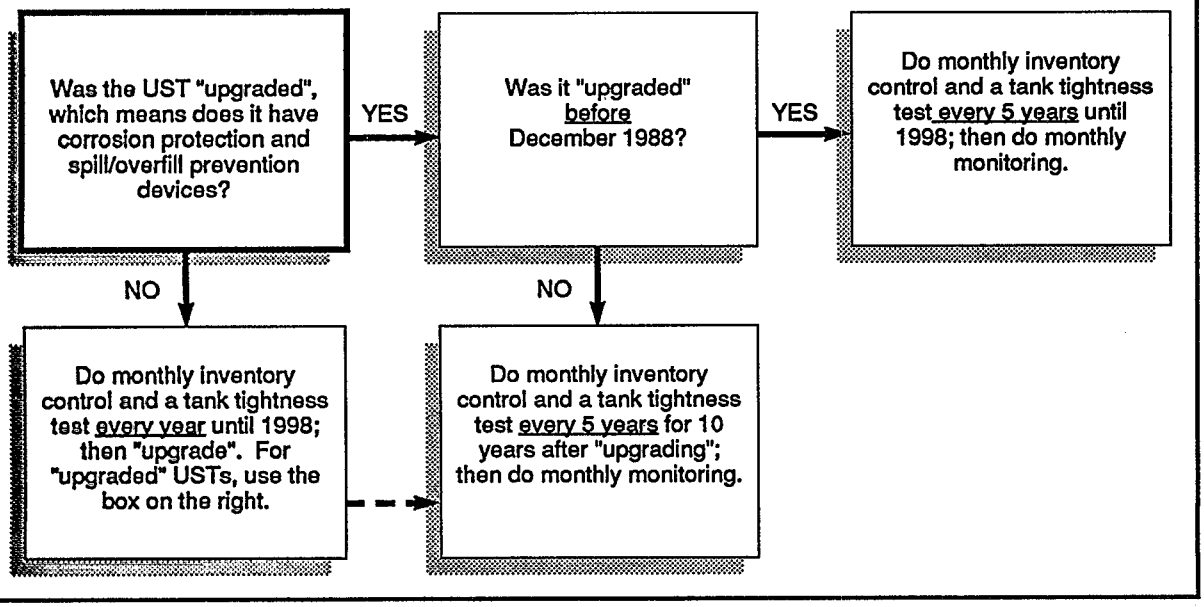
For WHAT you have to do, see the chart on page 17.

TYPE OF TANK & PIPING	LEAK DETECTION	CORROSION PROTECTION	SPILL / OVERFILL PREVENTION
New Tanks and Piping*	At installation	At installation	At installation
Existing Tanks** Installed:	By No Later Than:		
Before 1965 or unknown	December 1989	December 1998	December 1998
1965 - 1969	December 1990		
1970 - 1974	December 1991		
1975 - 1979	December 1992		
1980 - December 1988	December 1993		
Existing Piping**			
Pressurized	December 1990	December 1998	Does not apply
Suction	Same as existing tanks	December 1998	Does not apply

* New tanks and piping are those installed after December 1988
** Existing tanks and piping are those installed before December 1988

IF YOU CHOOSE TANK TIGHTNESS TESTING AT EXISTING USTs . . .

If you don't use monthly monitoring at existing USTs, you must use a combination of periodic tank tightness tests and monthly inventory control. This combined method can only be used for a few years, as the chart below displays.



of all regulated tanks?

- Are USTs in compliance with all applicable federal, state and local regulations?
- Do new USTs meet all required design specifications for their particular use?
- Have tank upgrades and installations been performed by qualified or certified personnel?
- Do local employees know and observe required operations and maintenance procedures?
- Are leak detection records scrupulously kept and monitored?

Records, service manuals and other important documents should be in an accessible location for use when needed. One community learned an expensive lesson when it routinely collected delivery and dispensing records for a once-a-month review by the town bookkeeper. When the figures showed 200 gallons more had been delivered than were either dispensed or still in the tank, testing revealed a substantial leak.

The following discussion of tank management requirements for USTs highlights the responsibilities of local elected officials. It is not intended to be exhaustive, and you should obtain a complete set of regulations which apply to your community's USTs from the appropriate state or local agency. Appendix c lists additional sources of information for local officials, engineers, installers and others who may be involved in meeting these general operating requirements.

Notification requirements. Federal regulations contain several notification schedules requiring local governments to provide information about their USTs to the proper authorities. Some of these deadlines have already passed. For example, the owners and operators of all USTs in operation after January 1, 1974, should have notified the designated state or local agency about each of their tanks by May 8, 1986. This requirement applies even to tanks which were abandoned or closed down between 1974 and 1986.

For tanks installed or upgraded since the 1986 notification deadline, owners and operators have 30 days from the beginning of operation to submit a standard form providing information on the tank's age, size, type, location, uses and contents.

Local officials should make certain that all required notification has taken place, that local records are current and that they are on file. You may direct questions about notification to your state UST agency or to other local agencies that have authority for community storage tanks.

Tank design. EPA requires that all new tanks be designed and constructed to prevent corrosion and structural failure for as long as they are used to store gasoline and other regulated substances.

The exact components of a community's new UST system may be determined by the collective recommendations of the project engineer, equipment supplier and/or installer and others. But local officials should make certain, in writing, that the tank system they select is compatible with the product to be stored, and that the tank and piping meet the standards of trade associations or testing firms such as the Steel Tank Institute (STI), Association of Composite Tanks (ACT) and Underwriter's Laboratory (U.L.).

Local officials must also keep records showing that tank specifications meet federal and/or state requirements.

Installation. Improper installation of a new UST system can damage the structural integrity of both the tank and the piping. Experience and the commitment to follow accepted installation practices are the keys to selecting a qualified contractor. Major installation problems result from:

- improper siting and excavation practices (cave-ins are a major liability risk);
- inappropriate backfill material and inadequate compaction to hold the tank and piping in place; and
- loose fittings or threading on piping and vent lines, resulting in leaks during normal operations or when the tank is overfilled.

To eliminate these and other problems, EPA requires that UST installers be certified in one of several ways, including the following:

- certification by the tank and piping manufacturers;
- certification or licensing by the implementing agency;
- inspection and approval of the installation by a registered professional engineer;
- inspection and approval of the installation by the implementing agency;
- adherance to the manufacturer's checklists; and
- compliance with another method which the implementing agency has approved.

Local leaders should make certain that contracts contain appropriate language relating to required installer certification and to the installation of the tank itself.

In addition to the certification process developed by EPA, at least 25 states have their own certification procedures. Many of these procedures make reference to codes and standards developed by industry, fire fighter associations and others. Since practices vary from state to state, local leaders should ascertain the procedures required by their designated state UST agency.

Operations and maintenance. Spill and overflow devices are required on all new USTs and, by December 22, 1998, on all exiting tanks. Surface spills and inadvertent overfilling of tanks cause more releases of gasoline and other stored chemicals than either tank or piping failures. While the volume of the chemical product lost is generally not equal to an underground leak, most spill and overfill releases are due to human error, not equipment malfunction. UST owners and operators are required to follow procedures which prevent spilling and overfilling of gasoline (and other regulated substances) during transfer operations.

Local governments are particularly vulnerable to these regulations. EPA does not allow tank owners to transfer responsibility for overfills to the local supplier, even if delivery is the only procedure during which an accidental release during filling could occur.

In addition, local governments may have a num-

Many small towns continue to satisfy leak detection requirements through the manual gauging of fuel levels and the annual tightness testing of tanks. Gauging sticks should be calibarated to 1/8 of an inch and the measurements accurately recorded and regularly reviewed.

Photo by Lawrence Productions

ber of untrained employees or volunteers (fire fighters, maintenance crews, rescue workers, etc.) who fill municipal vehicles, particularly during emergencies or inclement weather. Proper training, use of uniform procedures and limiting the number of UST users can all help control accidental spills. Local officials must ensure that written procedures for filling and dispensing operations are posted prominently at the UST site, that personnel are trained when necessary and that proper procedures are followed. Finally, spill and overflow devices should be tested and maintained according to manufacturers' recommendations.

Local governments might consider instituting a requirement that one person must always be present to monitor transfer operations both in and out of the UST. (Some states have such a requirement, although it is not part of the federal regulations.) Many damaging releases have occurred when an individual took a break during a lengthy tank filling process, only to return and find that the automatic cutoff equipment had not worked.

Corrosion protection. EPA regulations require not only that corrosion protection be provided for the storage tank and piping, but also that the system be tested regularly. In addition to inspection at the time of installation, EPA requires that:

- all cathodic protection systems be tested within six months of installation and at three-year intervals thereafter;
- impressed current cathodic protection systems be inspected every 60 days ; and
- inspections be conducted by a qualified "cathodic protection tester." (Local employees can qualify to be testers.)

Localities must keep records of the last three inspections, as well as the results of the last two tests conducted on the cathodic protection system. There are no cathodic protection test requirements for fiberglass tanks, which do not corrode.

Repairs. During the useful life of any UST system, repairs are likely to be needed for preventive purposes or to correct a problem. Both steel and fiberglass tanks must be repaired according to codes developed by nationally recognized associations or testing laboratories. Pipes and fittings must meet the manufacturer's repair standards. All tank repairs are subject to tightness testing or other EPA-accepted practices within 30 days to confirm that the repairs have been completed successfully.

Cathodic protection systems must be tested within six months of repair. As with other areas of UST operations and maintenance, local governments must maintain records which indicate their compliance with federal or state repair standards.

Leak detection record-keeping. This is perhaps the most important operating requirement for small and rural governments that continue to own and operate USTs. The early detection of a leak is critical to limiting environmental damage and potential liability claims. A wide variety of leak detection methods satisfy federal and state standards, but all require careful observation and record-keeping to provide maximum protection.

Federal regulations require local governments to keep leak detection records for each UST. The records cover such areas as maintenance and repair and results of all scheduled testing, sampling and monitoring.

The type of records kept varies from system to system. State and/or local UST agencies determine how long these records must be retained and how frequently they must be reported.

While larger communities may be able to afford the extra protection of automated or in-ground monitoring, many smaller towns may rely, for years to come, on the manual gauging of tanks combined with annual tightness testing. Remember that a dipstick can check only the internal fuel level which fluctuates

with the temperature and other variables, but that this method includes no external system, such as water or vapor monitoring, to detect a slow, steady leak.

Release procedures. Few local governments are prepared for an underground gasoline accident, and leaks and spills may occur at even the newest or best managed UST facility. The EPA regulations list a series of short-term and long-term responses which local governments must carry out if an accidental release occurs. Many steps follow closely the familiar emergency response procedures for an aboveground chemical spill.

From a local government perspective, the keys to dealing successfully with accidental releases are to report them immediately, follow an emergency response plan, act swiftly to stop the release and to clean up the contamination and keep careful records of all actions taken to minimize the threat of liability. Local governments should obtain a full set of spill and release requirements and incorporate them into local emergency response plans.

In responding to a confirmed leak, local leaders must:

- report regulated releases to state or local authorities (localities must report all underground releases and all aboveground releases exceeding 25 gallons, or those that visibly contaminate a source of surface water);
- minimize threats to human health (including explosive vapors and fire hazards);
- prevent further release;
- determine contamination levels; and
- remove released product and contaminated soil and dispose of these materials properly.

The state may require the development of a corrective action plan for releases that involve major contamination of soil and groundwater.

Temporary or permanent closure. Temporary closure requirements apply to all regulated tanks which are not used for three to 12 months. The tank should be emptied of regulated substance during this time. Corrosion protection and leak detection systems must continue to be operated and monitored, all lines (except vents) must be capped and all access points to the tank (such as pumps and manways) must be secured.

If a tank is to be closed permanently, owners must notify the appropriate regulatory agency at least 30 days in advance, remove all product and clean the tank of all remaining liquid and accumulated residue. The tank must then be removed from the ground or filled in place with an inert material. Finally, owners must test the surrounding soil for contamination and, if necessary, take corrective action before closure procedures can be considered complete. Local governments must keep detailed, permanent records of all actions taken in closing a UST temporarily or permanently. In many states, closures must be inspected by state agency personnel before they become final. Some states require complete removal of a tank rather than allowing closure in place.

Financial responsibility requirements

Undetected leaks and accidental spills can lead to very expensive cleanup and liability costs. Federal and state financial responsibility regulations now require that UST owners and/or operators demonstrate their ability to take corrective action and to compensate third parties for bodily injury or property damage.

The federal UST regulations establish separate compliance requirements and schedules for different sizes and classifications of owners and operators. The vast majority of local governments fall into the category of owners/operators which must demonstrate the ability to provide:

- a minimum of $500,000 to cover costs for individual releases; and
- a minimum of $1,000,000 to cover costs of annual aggregate releases (should more than one leak occur).

The minimum amount for individual, or "per occurrence," coverage increases to $1,000,000 if the total "through put" of petroleum dispensed by the local government exceeds 10,000 gallons a month. Local governments must meet applicable federal financial responsibility requirements within a year of their promulgation (now scheduled for October 1992) or within 30 days of putting a new or upgraded tank into service once the requirements become final. Many states, however, already have such requirements in place.

Insurance is not the only method that local governments may use to demonstrate financial responsibility. Federal regulations list a number of alternate mechanisms related to a local government's net worth, bond rating and other financial indicators that establish the ability to pay the required minimum amount for cleanup costs and liability claims. Most of the options are based on the principle that large municipalities can cover the required costs without purchasing insurance. Small and rural governments, however, may not have the fiscal capacity to qualify for a number of the self-insurance options.

EPA's list of allowable mechanisms to demonstrate financial capability includes the following:

- financial test of self-assurance
- fully-funded trust fund
- guarantee contract
- UST insurance
- letter of credit
- risk retention group coverage
- state-required mechanism
- state fund
- state assumption of responsibility
- surety bond
- bond rating test
- work sheet test
- maintenance of funded balance

The U.S. EPA has proposed to add four additional mechanisms to its final rule on financial responsibility requirements for local governments. These mecha-

nisms broaden the ability of smaller jurisdictions to meet the conditions for self-insurance.

The UST regulatory agency in your state may have restricted some of these options, as well approving others which are not listed. We will not attempt to summarize or recommend choices from among the available mechanisms. Most require some detailed knowledge of your community's financial situation before they can be judged as viable options for demonstrating financial responsibility.

EPA has encouraged states to develop and promote state-sponsored assurance mechanisms for local governments (and sometimes for small retailers), and at least 43 states currently operate or have passed enabling legislation to establish a state assurance fund. The deductible amount which local governments must pay in the event of a leak varies from state to state and can run as high as $100,000. Other state assurance funds do not cover the full $1,000,000 required for aggregate annual coverage.

Private insurance, which has been extremely hard to purchase for publicly-owned USTs, is now selectively available. But some local governments may discover that even though they are in minimum compliance with the federal and state technical standards, they cannot obtain the insurance they need to stay in operation.

Both private and public insurers say they must make insurance decisions on the basis of risk management. While they wish to offer local governments protection from catastrophic loss, they must also minimize their own liabilities. Many companies or state pools will not insure tanks that carry high risks—tanks over a certain age or those that lack automatic leak detection devices, secondary containment, etc. In the same way that health insurance companies shy away from individuals with poor medical histories, UST insurers do not take "unhealthy patients," i.e. tanks with a profile suggesting impending or past disaster.

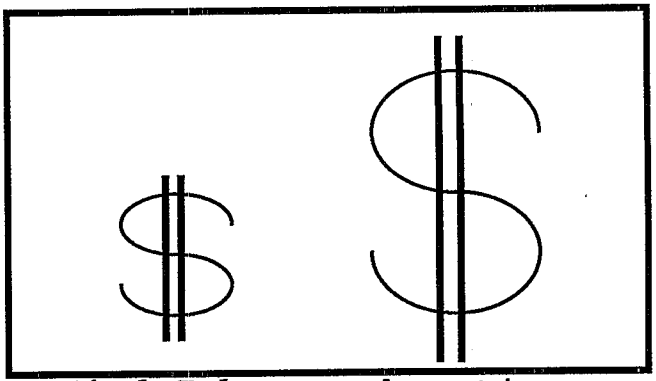
When weighing the options available to fulfill the technical standards, local leaders must factor in the cost and availability of insurance. A $3,000 vapor monitor, for example, may pay for itself in a few years when reduced premiums are considered. Likewise, installing a corrosion protection system may mean the difference between obtaining the insurance necessary for continued operation or being shut out of the insurance market altogether.

Local leaders must maintain careful records of the community's compliance with UST financial responsibility requirements. They must inform the appropriate agency when they have met the requirements, when they change the mechanisms for compliance and if and when the community is no longer able to meet the financial responsibility requirements.

Under pending federal regulations, most small local governments will be required to demonstrate the ability to provide a minimum of $500,000 to cover the cost of cleaning up an individual release and a minimum of $1,000,000 to cover cleanup of all releases occurring in one year.

$1,000,000

$500,000



Single Release **Aggregate**

chapter 3

risk management options

There's an old saying, "If it ain't broke, don't fix it." This certainly has been the attitude of most UST owners and operators. Once the tank was installed, very little was spent on operations and maintenance, unless a catastrophic leak occurred. And few local governments carried insurance to cover cleanup costs and other liability claims.

This has changed dramatically. The "Love Canals" of the 1970s and 1980s resulted in significant public concern about soil and groundwater contamination. Legislation has been passed at the federal, state and local levels establishing a variety of regulatory programs designed to prevent and mitigate releases from underground tanks. These regulations mean new costs and other potentially significant responsibilities for owners and operators of underground tanks. Specifically, local governments are now required to upgrade or replace tanks and piping networks, to operate and maintain existing and new UST systems properly, to monitor for leaks and spills, to meet financial responsibility (liability) requirements, to complete corrective actions at locations where spills or leaks occur and to close underground tanks safely.

The cost of complying with the new regulations can be dramatic. Let's compare the pre- and post-regulatory cost of responding to a 50-gallon leak from a typical municipal tank. Historically, the costs for remediating the leak were approximately as follows:

Item		Cost
Tank excavation		$1,000
Tank/piping repair		2,000
Site restoration		1,000
Management		1,000
	Total	$5,000

Given the current regulatory setting, the cost of remediating a similar leak is substantially higher. Today, the following costs might be incurred:

Item	Cost		
Tank testing	$0	to	$1,000
Tank/piping repair or replacement	3,000	to	60,000
Soil and /water contamination investigation and remedial engineering	10,000	to	50,000
Soil remediation	5,000	to	25,000
Groundwater remediation	0	to	100,000
Site restoration	2,000	to	4,000
Management	5,000	to	10,000
Total	$25,000	to	250,000

Risk management

The cost of responding to a leak now averages between $50,000 and $100,000, figures that are certain to rise as regulatory programs become more stringent. Faced with the prospect of such enormous liability, local leaders can hardly afford to take a chance that their tank will leak. Many local governments are now using risk management to assess their potential liabilities.

Risk management is a relatively new concept for local elected officials. It is a way of thinking, or a problem-solving technique, that seeks to minimize the liabilities to which local governments are exposed. Kenny Rogers provides a good introduction to the principles of risk management when he sings, "You gotta know when to hold 'em, know when to fold 'em." But risk management isn't really gambling. It

Underground and aboveground tanks protect city's fuel supply

In the past year, Bastrop, La., (pop. 14,000) has utilized two cost-effective methods to solve its fuel storage problems. The city consolidated all motor fuel tanks for city-owned vehicles at a single location and placed new monitoring wells around the site to detect leaks. At the municipal airport, the city installed two aboveground tanks for aviation fuel to replace the underground tanks that did not meet new state regulations.

According to Bastrop Mayor Clarence W. Hawkins, the city's primary concern with both sets of storage tanks was public health and safety. Because a number of older tanks were scattered throughout the city, local leaders realized there was a significant chance of a leak occurring. On a recommendation from the public works department, the city council closed down several tanks and centralized all fuel storage at the city's maintenance garage. Two tanks were removed according to the closure procedures established by Louisiana's Department of Environmental Quality (DEQ). By using its own equipment and work crew, the city saved considerable money on the two closures.

"The DEQ was very cooperative," according to Mayor Hawkins. "The staff informed us when an inspector would be available to supervise and approve the work. At both sites, we found contamination from past leaks, but no fuel had reached the groundwater."

The contaminated soil was taken to a city-owned concrete slab for aeration and returned to the original site after a state-approved inspection was completed. Hawkins says the willingness of the state to allow the use of home town labor kept removal and closure costs to a manageable $6,000. Bastrop's remaining tanks, protected by in-ground monitors, will be removed and replaced in a few years when they near the end of their useful life.

The USTs at the airport presented a more immediate challenge. Bastrop is a growing regional economic center which has benefited greatly from the municipal airport since it opened in the mid-1960s. In December 1990, however, the city's private aviation fuel supplier decided to close the underground storage tanks which the firm had installed 25 years earlier. The dealer told city officials that he could not afford to replace the tanks for the relatively small amount of fuel that he sold.

The city council moved quickly to maintain service to such major employers as the International Paper Company, which frequently flies corporate executives in and out of the airport.

Mayor Hawkins assigned a city employee familiar with storage tank operations to explore alternatives. Within two months, the city approved a contract to install two aboveground, 1,500-gallon fuel tanks surrounded by a concrete catchment basin. Choosing the lowest of three bids, the city completed the tank installation for $18,000.

Hawkins says the aboveground tanks made sense, both in terms of the protection offered and the dollars saved. "Leaks are visible from either the tanks or the piping," says the mayor, "and they are monitored daily by our airport manager whenever he dispenses fuel." The tanks are located far from the runways, and the catchment basin could contain leaking fuel, even from a ruptured tank.

While aboveground tanks are not currently regulated under Louisiana law, Bastrop's tanks and dispensing system meet all industry standards. And, notes the mayor, the tanks meet all Federal Aviation Administration standards, so the city can maintain its coverage for any liability associated with the airport's USTs at no additional cost.

Bastrop, La., stores aviation fuel in two aboveground storage tanks at its municipal airport. The city installed these tanks when its private fuel supplier decided to close down, rather than replace the underground storage tanks which no longer met state regulations.

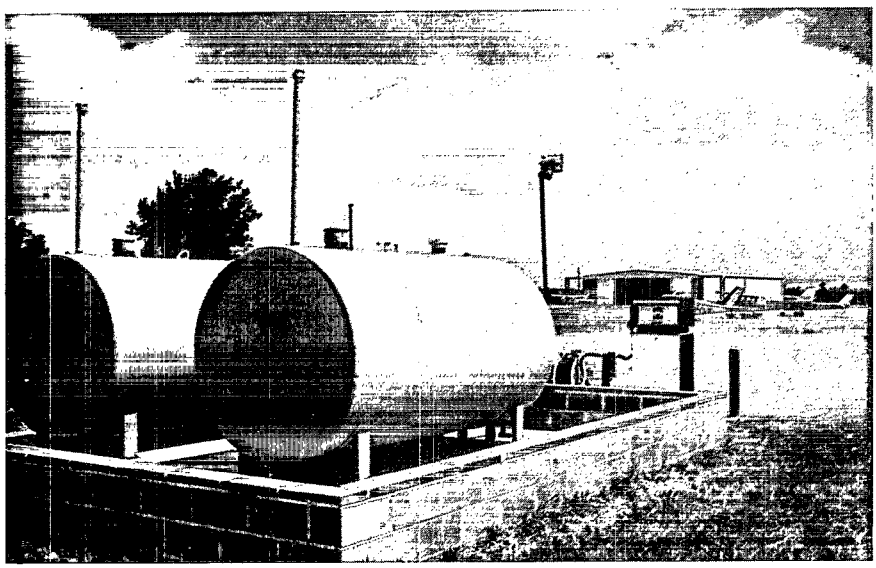


Photo by Lawrence Productions

involves calculating the odds that something may happen and then trying to improve the odds in your favor.

For example, accidents at improperly marked intersections have led to substantial liability claims against municipal governments. Many localities now limit their risk by using tamper-proof stop signs, by trimming trees and brushes regularly and by posting signs that warn of the upcoming stop. Similarly, given the potential liabilities posed by underground storage tanks, UST owners and operators can save a great deal of money by using a risk management approach.

Risk, in general, must be viewed from two perspectives: first, what is the magnitude of or cost associated with the risk; and second, what is the probability or chance that the risk or financial exposure will occur?

The liabilities associated with underground storage tanks can cover the entire range of frequency and cost. Leaks and spills can vary from a simple splash when filling a vehicle to a catastrophic tank rupture that contaminates the groundwater. The probability of these situations' happening also ranges from very frequent to only once in the useful life of a tank.

Once you know the magnitude and probability of your tank's potential liabilities, you can weigh the management and technical options to reduce these risks as much as possible.

Some risk managers and local officials find the following chart to be a useful tool in setting priorities:

		PROBABILITY	
		minimum	maximum
COST	minimum		
	maximum		

Compared with the probability of a spill while pumping gasoline, the chance of a major tank leak is considerably less. But the cost or magnitude of the risk, if it occurs, is usually enormous. And the odds go up as tanks get older.

Using the risk management approach, a local official might decide that it is worth installing a $3,000 monitoring system to avoid the $100,000+ of liability that would occur if a leak were to go undetected. A further consideration would be the likely reduction in insurance premiums.

Risk management for USTs is an improvement over gambling in another important way. It takes the guesswork out of what cards the other player is holding. A tank analysis and site assessment can help calculate the odds that a UST risk management program must beat.

It's time to quit gambling with your storage tank if it is:

- 20 years old or older
- located near underground power lines
- located near grounding for lightning rod systems from towers or buildings
- constructed of unprotected steel
- single-wall construction
- without a leak detection system
- near a surface water supply
- sitting on a high water table
- sited on rocky or shifting soil
- near railroad tracks or another source of vibration

Fortunately, a growing number of options is available to reduce both the magnitude and probability of the risks associated with owning and operating underground storage tanks. The following sections identify some of these options and outline the advantages and disadvantages associated with each.

Closing existing tanks. How many tanks does the town need, and where do they need to be located? In answering these questions, many towns and townships may discover that the number of tanks in service exceeds the number needed to meet operating obligations. For example, adjacent police and fire departments may each operate their own underground storage tanks, the local school may employ multiple tanks to store heating oil, inactive tanks may not have been adequately closed, etc. Every tank poses potentially significant liabilities, even those not covered by federal or state regulations.

One risk management option consists of closing all existing tanks that are not essential to daily operations. The advantage of this approach is the elimination of potential liabilities associated with continued operation of each tank. Capital costs are involved in closing a tank, and the closure process may reveal that a leak or spill has occurred. Additional financial resources will be required to investigate the extent of the contaminated soils and/or groundwater and to remediate any identified contamination. Investigation and potential cleanup costs invariably increase if tanks are improperly closed or if closure is delayed.

Commercial supplies. Towns and townships may also reduce risk by maximizing the use of commercially available fuel supplies. If gasoline or diesel fuel are available nearby, local governments may choose to close down one or more of their USTs.

Reliance on commercial fuel not only removes local governments' potential liabilities, but also eliminates operation and maintenance costs. While buying fuel commercially increases expenditures, the difference is usually only a few pennies per gallon. One county in Montana dug up its old tanks and now buys all its fuel from a 24-hour, centrally located convenience store. While the cost of gas has increased by $3,000 a year, the town has saved the cost of insurance, which would be several times that amount, as well as the cost of installing new tanks, estimated at $60,000.

Local governments are open to substantial lawsuits if they are late in answering a call for help. Even more important than cost considerations, then, is access to commercial fuel when snow removal or emergency response demands it. Some local govern-

Fear of liability prompts town to replace old tanks

In order for its many vehicles to access fuel easily on a 24-hour basis, the Town of East Haddam, Conn., (pop. 6,676) is staying in the fuel storage tank business. Two state-of-the-art 1,500-gallon gasoline and diesel tanks and a computerized key card system will soon be installed at the town's new public works facility. With a push from the state and supervision from a local certified installer, a public works crew removed two aging underground storage tanks and set up a temporary 500-gallon aboveground fuel tank to be used until the new tanks are installed. First Selectman John Blaschik Jr. says that fear of liability was the town's principal motivation for replacing the aging tanks.

The Town of East Haddam is a rural community along the Connecticut River, 35 miles from Hartford. Scattered among the town's 58 square miles are numerous summer resorts, two large state parks, scenic open spaces, numerous rivers and lakes and historic sites, including the Goodspeed Opera House, a highly acclaimed regional theatre where the Broadway shows "Man of La Mancha" and "Annie" originated.

To service vehicles of the town's public works department, senior services, police, emergency services and fire department, East Haddam has always owned and operated fuel storage tanks. Until 1990, the town monitored two 1950s underground gasoline tanks through stock inventory (daily logging) and did not detect any leaks.

But Blaschik knew that the town was living on borrowed time. Because the aging tanks were situated just uphill from the Goodspeed Opera House, a large restaurant and the Connecticut River shoreline, even a small, undetectable leak could have caused major environmental damage and placed the town at tremendous financial risk. Also, Blaschik had just supervised an emergency tank removal project at the local public schools, an expense he did not wish to repeat.

Local officials had hoped to close down the old tanks and install modern, fully secure tanks at a new public works facility. But as financing for the new facility delayed, Blaschik switched to "Plan B". East Haddam hired Maus and Son Inc., a local plumbing and heating contractor and certified tank installer, to empty the tanks' fuel and sludge contents and install a temporary 500-gallon aboveground fuel tank. The tank was approved by the local fire marshall and building inspector. Maus and Son, which is also a fuel retailer, agreed to fill the tank weekly.

This interim strategy seemed workable until Connecticut Department of Environmental Protection inspectors determined that East Haddam was violating state law by failing to remove the abandoned tanks that remained underground. Blaschik was neither shocked nor displeased by the enforcement order. Pressure from the state permitted Blaschik to approach the Board of Finance for additional funding to remove the tanks, inspect the soil and groundwater for contamination and—finally—eliminate the town's risk exposure. Since 1986, East Haddam's insurance policy has incorporated a rider on all liability from environmental accidents, which leaves town finances solely responsible.

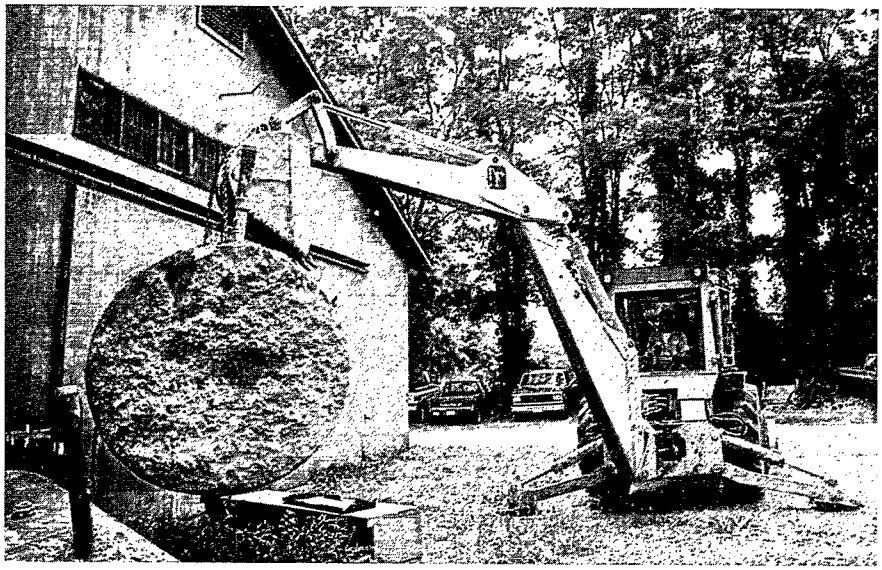
As it turned out, the removal job was not very costly. Blaschik saved about $10,000 by using his own manpower and equipment to dig up the tanks, under the supervision of Maus and Son. The local fire marshall, who conducts soil inspections with authority from the state, determined that the ground was not contaminated. If remediation had been required, Blaschik estimates that he would have spent at least $60 per ton to dispose of the contaminated soil.

By September 1991, East Haddam will complete phase one of its public works project. Capital improvement funds totalling $75,000 will finance the construction of a salt shed facility and two new permanent fuel tanks. Now that many of the town's vehicles use diesel fuel, one of the tanks will store and dispense diesel; the second will contain gasoline.

Maus and Son Inc. is advising East Haddam on the design and cost of the new 1,500-gallon tanks. One option is to use permanent aboveground tanks that are sometimes simpler and less costly to install. But compared to USTs, aboveground tanks are more subject to vandalism and fire and less able to maintain the fuel at a stable temperature. The State of Connecticut recently issued regulations governing aboveground fuel tanks that require owners to surround the tank with a steel box or some other type of containment. Because Maus and Son owns and maintains its own fuel tanks, vice president Mike Maus is well versed in this new UST requirement, as well as other environmental regulations. He suspects that the new aboveground regulations will equalize the installation costs of the two systems.

Once the tanks are installed, East Haddam will set up a reader card system which will log each fill up automatically. Each piece of equipment will have a unique card to record the amount and time of day at which the fuel was taken. The card system will replace the cumbersome, less accurate manual logging system town employees now use.

What advice does First Selectman Blaschik offer to other town officials facing UST decisions? Look to knowledgable local contractors for advice, and don't let the state regulators get you down. "Everyone's on the same side," he says.



The town of East Haddam, Conn., replaced its aging underground storage tanks with a new centralized facility. The town saved over $10,000 in total costs by using its own equipment and personnel to remove the old tanks, under the supervision of a certified private installer. (See case study on East Haddam, page 26.)

Photo by Lawrence Productions

ments have worked out a key card system which allows municipal vehicles to fuel up even during the hours that the commercial facility is closed. The cards not only permit the dispensing of fuel, but also record the amount dispensed and the department to which the fuel should be billed.

Local governments must also consider the long-term reliability of their suppliers. The liability issue could surface again if you close down your tanks and, two years later, the only local fuel dealer shuts down. Before signing a contract, therefore, make certain that the supplier has met the applicable UST regulations, is financially secure and is committed to staying in the fuel business.

Whether buying from the private sector or maintaining their own tanks, many governments have developed mechanisms for 24-hour access to fuel, including cooperative agreements with neighboring local governments, maintenance of emergency fuel supplies and installation of backup fuel tanks in selected vehicles.

Use of alternative fuels. In some cases, there are acceptable substitutes for the regulated products being stored in underground tanks. Many states regulate the storage of heating oils at non-residential locations, but alternative fuels, including natural gas and electricity, do not require the use of underground storage tanks. Similarly, rapid advances are being made in development of alternative fuels for vehicles, and some vehicles can be converted to propane, for instance.

The advantage of alternative fuels or energy sources is to reduce the need for underground storage tanks and thus reduce potential liabilities and risks. For towns and townships, the most significant disadvantage of alternative fuel is likely to be cost. For example, while the cost of natural gas for heating is generally comparable with the use of heating oil, the cost of electricity often is substantially higher.

Regionalization. Some local governments are utilizing a regional approach to minimize the cost of complying with new UST regulations. Generally, towns, school systems, fire departments and others install a large, centrally located facility with one or more tanks. In New England, a number of facilities use key card systems to insure accurate billing and 24-hour access. Other local governments have closed their tanks and now buy fuel from another public entity (such as a county highway department or local school system) which has met the regulatory requirements.

The advantage of the regional approach is that individual governments share the cost of compliance with others and eliminate some or all of their existing tanks.

Regional facilities, however, are not likely to meet local needs in sparsely settled areas. Fuel must be accessible, in a timely manner. When contemplating a regional facility, local leaders must consider the maximum acceptable driving distance in terms of cost, convenience and public safety.

Privatization of UST systems. Many private-public partnerships involve contracting with an outside vendor to operate facilities owned by the local government. Under municipal lease arrangements, the vendor constructs and then continues to own and operate the leased facility. Several commercial vendors are willing to install and monitor new underground storage systems in exchange for periodic lease payments.

With a UST lease agreement, local leaders can reduce, or eliminate altogether, the number of tanks they own and operate. Another advantage is that the capital costs associated with the installation of a new tank are usually amortized (spread out) over the term of the lease. In addition, the leasing company typically provides insurance or otherwise satisfies the financial responsibility requirements. The disadvantage of transferring responsibility of USTs to the private sector is that the cost per unit of storage capacity

Effective local leadership key to successful UST project

A strong desire both to maintain the environmental integrity of the community and to comply with new underground storage tank (UST) regulations motivated the leadership of Willistown Township, Pa., to undertake the recent replacement of its aging fuel tank system.

Just over two years ago, when they became aware of new U.S. Environmental Protection Agency (EPA) and state regulations on USTs, the supervisors asked Township Manager Bill Rosenberry to find the most effective way to come into compliance. Public Works Department, Police Department and other vehicles relied on two township-owned tanks that fell under the new regulations.

Ordinarily, the first step in addressing potential UST problems is a comprehensive evaluation of the old system. According to Public Works Director John DiMascio, the township decided not to take this step because the steel tanks and piping system were of undetermined age, and he was sure an evaluation would result in a recommendation to remove the old system. DiMascio, who directed the UST project, first familiarized himself with the nuts and bolts of the federal and state regulations and then, with some help from a local engineering firm, drew up specifications for removal of the old tank system and installation of a new UST system. The proposal very specifically laid out the necessary components of a successful bid, including specific citation from the regulations and a requirement that the contractor certify that each stage of the process would conform to state and federal guidelines. The proposal was sent out to several qualified contractors, and the low bidder was awarded the contract for both phases of the project.

As part of the removal and site closure process, samples were taken from soil around the old tanks and piping system. A small amount of contaminated soil was discovered and removed before the ground was filled in. Fortunately, the contamination was not caused by a leak in the old tanks or pipes; rather, minor spills had resulted from improper filling.

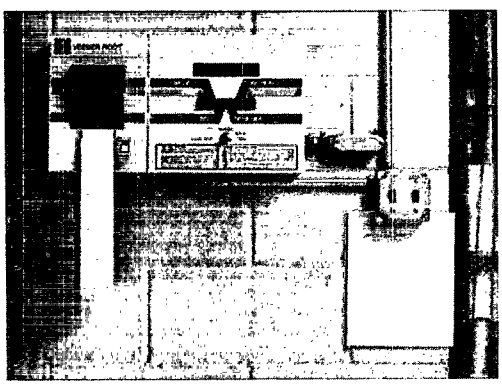
The new fuel system consists of two 2,000-gallon fiberglass-reinforced polyester tanks, one for unleaded and one for diesel fuel, and a suction-operated fiberglass piping system with cathodically-protected swing joints. Leak detection is accomplished with an electronic automatic tank gauging and inventory control system that is capable of automatic and on-demand leak detection, as well as sophisticated inventory monitoring. The extensive use of fiberglass removed the need for external corrosion protection, and the automatic inventory system and suction piping eliminate the need for external leak detection. The township saved money by reusing the pumps from the old system.

The township decided to go with underground tanks for aesthetic reasons. According to Township Manager Rosenberry, "Willistown is an old and scenic township with a distinctly rural flavor. A large aboveground facility probably wouldn't have been acceptable to community residents."

Fuel is disbursed with a key control system. Each township vehicle, from the dump truck to the lawn mower, has a numbered key for a designated slot on the pumps. This system allows township officials to track the monthly fuel consumption of each vehicle and thus manage resources effectively.

The total project cost was just under $55,000, which the township was able to finance with existing tax revenues. Meeting the financial liability part of the regulations has not been easy, however. Townships in Pennsylvania have found it difficult to obtain adequate liability insurance for their USTs, even when they are using a state-of-the-art system. Potential remedies to this problem are being pursued before the state legislature.

Willistown's UST project has proved to be an unqualified success. The township has a safe, affordable and easily-monitored fuel supply that makes it easier to provide such essential services as police protection and road maintenance. Frank Hurley, a recently-elected supervisor, advises other officials faced with the task of complying with EPA and state regulations to "undertake the project as soon as financing is available. The long-run safety of the community depends on a willingness to address the immediate environmental and financial issues raised by the UST regulations."



When Willistown Township, Penn., installed a new underground storage tank system, an automatic gauging system was chosen to provide leak detection. Monitors in each of the seperate tanks provide daily updates on changes in volume and automatically calculate if a tank is leaking.

Photo by Lawrence Productions

is higher than if the town or township owns and maintains its own UST system.

Aboveground tanks. For many years, fire safety officials opposed the storage of flammable products in aboveground tanks. As a result, underground tanks were developed to save space and to reduce the potential for fire or explosions. Responding to the new environmental concerns associated with underground storage tanks, the Western Fire Chiefs Association (WFCA) recently amended its codes to permit the dispensing of fuel at service stations in aboveground tanks which meet certain minimum design requirements. This code is followed by the majority of the local and state fire jurisdictions west of the Mississippi River. The National Fire Protection Association (NFPA), whose codes are followed by approximately 35 eastern states, expects to propose a similar amendment later in 1991. (It should be noted that EPA followed many industry and association codes in drafting its UST regulations.)

Aboveground tanks reduce many of the risks associated with USTs. Leaks are visible, and most aboveground designs incorporate leak and spill collection systems. Many installers report that aboveground installations are less expensive than comparably sized USTs with their required cathodic protection and monitoring systems.

A word of caution: Many states already regulate aboveground tanks and other states and the federal government are likely to do the same. Aboveground storage tanks are subject to explosions from vapor leaks or vehicle collisions. Many new aboveground tanks come encased in concrete or are placed behind a substantial barrier, so they are likely to require more space than USTs and may not be suitable in densely populated areas. Make certain that if you decide to use aboveground tanks, they meet existing standards (or the standards that are likely to be enacted), that they are installed and registered properly and that liability coverage is available at a reasonable cost.

Upgrading existing tanks. Many towns and townships which own and operate underground storage tanks could meet applicable federal requirements by upgrading existing tank systems. But a number of states have adopted similar or more stringent requirements specifying particular technology options or accelerated compliance schedules. Local leaders must determine which equipment upgrades are compatible with the existing UST system and then select and install the equipment which most effectively meets the compliance requirements and limits potential risks.

In general, this option involves limited up-front capital expenditures, particularly if equipment is upgraded in phases to comply with regulatory deadlines. There are substantial disadvantages to this approach, however. Upgrading an existing tank which has already been in operation for a significant percentage of its useful life is not a cost-effective way to reduce risk. Sooner, rather than later, the entire system may need to be replaced. In addition, the capital costs associated with upgrading a tank in phases are likely to be significantly higher than completely upgrading a tank at one time. As a general rule, "breaking concrete" more than once results in duplication of certain activities and in added expenditures.

Installation of new tanks. For those towns and townships that must operate underground storage tanks, the installation of a state-of-the-art underground tank is the best risk management option. Although it's the most expensive, it provides the most protection against leaks and spills. Installing a state-of-the-art tank clearly meets all minimum design requirements specified in applicable state and federal regulations and requires only one construction phase over the life of the tank. This option usually enables the owner/operator to obtain UST insurance and often results in reduced premiums.

The installation of a new tank typically includes closing the old tank, remedying any soil and/or groundwater contamination and installing a new tank and piping network. Selection of the tank and its various accessories depends on the size of the tank required, the material to be stored, the applicable regulatory requirements and the relative need to minimize future risks from leaks and spills. If heating oil is stored in an area with limited potential to contaminate nearby surface or groundwater, for example, a single-wall tank might be suitable. On the other hand, if gasoline is stored in close proximity to a municipal well, a double-walled tank and piping network would provide added protection.

Other risk management techniques. Other risk management techniques for reducing the potential UST liabilities of towns and townships include reducing the toxicity of the stored materials by substituting less toxic products, moving or siting USTs in less environmentally sensitive locations, developing a contingency plan to provide prompt response to leaks or spills should they occur and training tank operators to use proper filling and dispensing procedures.

Optimizing a cost-effective risk management program. Determining the most effective risk management techniques for a particular town or township involves taking into consideration factors such as the size, type and condition of the tanks in use; the products being stored; local, state and federal regulations; the environmental setting in which the tanks are located; the extent to which the number of underground tanks can be reduced while meeting operating commitments; and the availability of capital and operating dollars. The following chapter outlines a methodology for local officials to use in assessing their potential liabilities and to select the best options for minimizing their potential risks.

Privately-owned fuel station allows county to close USTs

Huron County, Mich., has a lot fewer underground storage tanks (USTs) than it did a year ago. A new, privately-owned fuel station, which offers computer card access 24 hours a day, has enabled a number of area businesses, farmers and local governments to close down their own USTs. "The new Petro-lock station made the city's decision to shut down its USTs very simple," said Bad Axe City Manager, Chris Olson recently. "We had two aging 500-gallon tanks at City Hall located near two primary water wells. Even before the state of Michigan issued its regulations, we knew those tanks had to be removed."

Simple arithmetic and the chance to eliminate the city's liability for leaks and spills convinced Olson and the Bad Axe City Council to approve a five-year contract with Petro-lock. Gasoline and diesel fuel will cost about 2 to 4 cents more a gallon than if the city owned and operated its own tanks. Olson figures the city's fuel budget will increase about $200 a year, based on average annual consumption of 10,000 gallons. The city has also spent $1,000 to remove the existing tanks and close the site according to state regulations. But the city has avoided the cost of new tanks, and, most importantly, the possibility of catastrophic costs for UST cleanup and personal liability.

Petro-lock is the enterprise of Jeff Castle, a longtime area fuel distributor. Having sold fuel on the wholesale and retail levels for 18 years, Castle became interested in the new computerized dispensing and billing technologies for service stations, which he read about in trade publications. The self service station he envisioned and brought into being is accessible only through a computer card reader system on the pumps, which records not only the identity of the customer, such as school systems, police, private fleets, etc., but of individual vehicles as well. The card system also allows Castle to avoid billing sales tax to public, not-for-profit customers such as the city of Bad Axe and the county school system.

Huron County seemed like an ideal site for the installation of a large capacity, 24-hour-a-day facility. Located on the very tip of Michigan's thumb, the county is primarily a farming and recreational area of 33,000 people. With Lake Huron on three sides and numerous inland lakes, county residents have a long-time appreciation for the role that water plays in the local economy. Castle was confident that a number of private and public customers would gladly pay a few cents more per gallon when they realized the costs, both known and unknown, of remaining in the business of owning and operating USTs. "We offer our customers three important advantages: we're in business to stay, we're accessible whenever they need fuel and we've taken over all the liability that would be almost impossible for smaller operations to afford."

Castle's new facility is two miles from Bad Axe, the county seat, at a point where four major highways converge. Two state-of-the-art, 10,000-gallon tanks provide unleaded and diesel fuel, and a 10,000, gallon high octane tank may be added. Customers are issued access cards and individual vehicle cards.

According to Lee Smith, business manager for the Huron County school system, the county welcomed the opportunity to close down its tanks and avoid dealing with regulations or risks. "With 10 buses and seven other vehicles," says Ms. Smith, "our system has major fuel needs. When Mr. Castle approached us about buying from Petro-lock, we thought it was a good idea to get out (of the UST business) while we could."

Castle sees computer card super stations as a major trend in motor fuel delivery. "As a businessman, I sensed a need for this service here in Huron County. But local governments could also take the lead. Local leaders might approach someone like myself and say, 'We'll buy all of our gas from you, if the price is reasonable.' The card system is the key, because it allows totally accurate billing and gas at any time. And my station's never overcrowded, because I deal only with large volume customers."

Key card technology provides 24-hour access to motor fuel for local government vehicles. In Huron County, Mich., the opening of a privately-owned station which uses this system has enabled a number of local governments to close down and remove their old tanks.

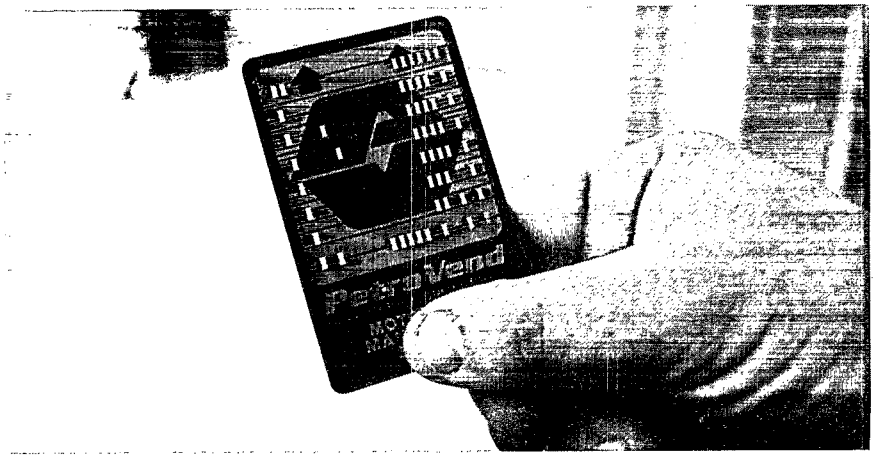


Photo by Lawrence Productions

chapter 4

making a choice

A well-known oil filter commercial warned, "You can pay me now, or you can pay me later." Local leaders face a similar choice with underground storage tanks: How much should the community spend today in order to avoid larger, potentially catastrophic costs tomorrow?

Earlier chapters have addressed UST problems, technologies, regulations and risk reduction. Each of these issues must be considered in making a final choice. Underground storage tanks present a unique challenge to local decision-makers, because there are predictable costs for meeting the technical requirements and unpredictable costs involved with leaks and spills. How does a community preserve its access to fuel and, at the same time, reduce the chance of catastrophic liability? A risk management approach enables local officials to weigh the costs and benefits of owning and operating USTs with alternatives that remove liability from the local governments altogether. This chapter is designed to give local leaders the resources to make an informed choice. The decision-making process outlined in Chart 3 can help narrow your choices to those that are possible and affordable. Chart 4 compares the major alternatives in terms of both average cost and potential risk reduction.

The results that local officials obtain from working through Charts 3 and 4 are not intended to replace professional judgement. Many of the tasks involved in choosing and implementing any of the alternatives will necessitate professional expertise. Most states require that certified or licensed personnel perform or oversee such procedures as tank testing and site assessments, tank installation and removal.

But local leaders can make a number of cost-saving, risk-reducing decisions using their basic knowledge of USTs and a systematic approach to local problems.

Key risk management decisions

Risk management is a strategy for cutting one's losses. It calculates the chance or probability that something will happen, as well as the impact that certain actions will have on limiting liability. Underground storage tanks involve high risk for local governments, because sooner or later many are going to leak. The longer that leaks go undetected, the greater the potential for enormous cleanup and damage costs.

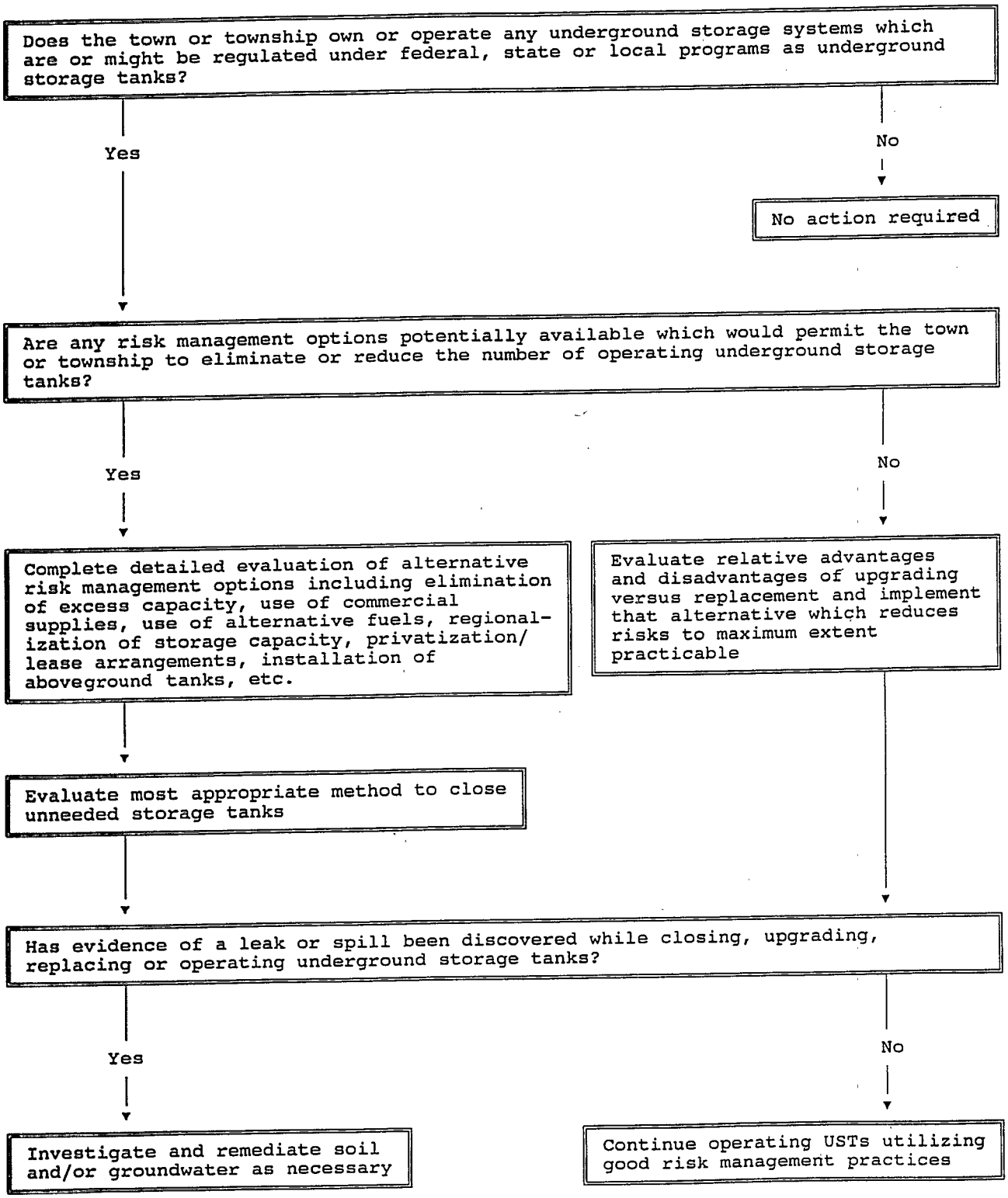
Local governments can substantially limit their vulnerability by following the decision-making path in Chart 3, Critical UST Management Decisions. The process involves:

- identification of regulated tanks
- closure of unneeded tanks
- evaluation and selection of fuel supply alternatives
- upgrading and/or replacement of existing tanks
- cleanup of any leaks or spills
- implementation of good management practices at all locally owned and operated USTs.

Regulated tanks. Federal, state and/or local law regulates most underground tanks which local governments use to store and dispense motor fuel. In theory, regulatory agencies should inform local officials about these regulations and the notification procedures that the officials must follow. In practice,

Chart 3

Critical UST Management Decisions



many tanks are still not registered. Local governments should determine whether a tank is regulated for three reasons: first, it is the law, and penalties may be imposed for non-registration; second, the regulations specify different compliance standards for different tanks based on size, age and type; and third, state assurance funds may cover only tanks that are regulated and that have been registered with the state. Only when the costs of compliance are known is comparison with other options possible.

The state regulatory agency or the local fire marshall's office can help local officials determine which tanks are subject to regulations.

Closure. For every UST that remains in operation, local governments must cover known costs and potential liabilities. Registration, testing and monitoring costs add up, and the more tanks there are, the greater are the chances for a leak or spill. But many tanks may be closed without conducting a detailed analysis. If adequate fuel capacity exists at strategic locations, then the closure of excess or unneeded tanks makes good sense from a risk management perspective.

For many small governments with one or two tanks, closure may not be an option unless the jurisdiction also implements some of the alternatives discussed in the next step.

Federal requirements allow for tanks either to be closed in place or to be completly removed. In either case, the tank must be thoroughly cleaned of remaining fuel and other substances before being filled with an inert material or removed for proper disposal. From a risk management perspective, tank removal allows for soil testing and corrective action at the site of the excavation, which protects the locality from future damage claims. It also eliminates an underground obstacle to future use of the site. Some states may not allow closed tanks to remain in the ground.

Alternatives. The regulation of USTs affects every tank owner and operator. Local government response to these regulations has ranged from meeting the very minimum compliance standards to installation of the latest high-tech equipment. Other approaches include intergovernmental cooperation to spread out among participating governments the costs and risks of maintaining a regional UST facility or transferring the risk to a third party, such as a private dealer. Each of these alternatives involves meeting compliance standards, calculating costs and benefits and measuring impacts on potential liability.

Chart 4 compares these factors for each of the major options available to local governments, whether they choose to continue to own and operate their own tanks or to buy fuel from another source. The dollar range for each expenditure category is based on national averages. While actual costs may vary substantially, the summary expenditure and risk reduction figures can help local leaders narrow their choices before investing in professional assistance.

Upgrade or replacement. The decision to upgrade or replace an underground storage tank depends largely on the age and condition of the tank. There must be enough useful life remaining to justify the investment in upgraded equipment. The improvements should also provide substantially improved leak and spill protection at less cost than tank closure and replacement. Until 1998, some tank owners can satisfy minimal federal compliance standards without adding corrosion protection or monthly monitoring devices for leak detection. EPA permits the use of manual gauging combined with annual tightness testing to be used for regulated tanks that hold less than 2,000 gallons. But it should be noted that from a risk management perspective, this option does not reduce local liability. In fact, risk increases with the age of the tank system.

Many states have more stringent compliance schedules and upgrade requirements than those found in the federal standards. In addition, many private and public insurance funds will not cover tanks that lack corrosion protection and leak detection equipment.

Rather than replacement, substantial upgrading

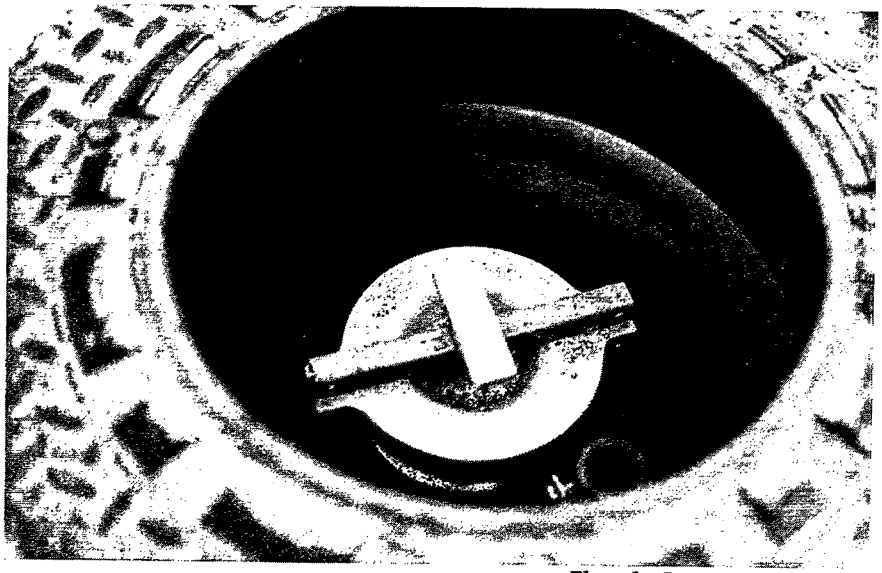


Photo by Lawrence Productions

Most fuel releases into the environment are caused by surface spills. All new tank installations are required to have spill and overflow protection devices, which may also be added to existing tanks systems.

can make sense if a tank:

- has never leaked
- has many years of useful life remaining
- meets local fuel capacity and location needs
- will meet future regulatory requirements when upgraded
- will save considerable dollars over replacement costs

Although it is the most expensive option, replacement of existing tanks offers owners and operators the maximum reduction of potential liability. Many experts recommend the installation of double-walled tanks if the community can afford the 50 percent additional cost over single-walled tanks. Since monitoring is continuous between the inner and outer walls, leaks are not only detected but also contained before they ever reach the soil or water.

Cleanup. Leaks or spills can happen during the operation, closure, upgrading or replacement of USTs. Under existing regulations, most of these releases must be reported. To limit potential liability, local governments should clean up all contaminated soil and water discovered during the process. When sites are properly closed and documented, localities are protected against future damage claims. In some states, local governments are allowed to use their own crews and equipment to remove and remediate contaminated soil. The work should be supervised and approved by regulatory staff or other authorized personnel who can certify that the cleanup met the regulatory standards.

Tank management. Managing risk is an ongoing responsibility. As long as a local government maintains its own storage facilities (or is a participant in a regional facility), it runs the risk of leaks and spills and the potential liabilities associated with cleanup and damage. New and upgraded systems offer substantially greater protection than the tanks on which local governments have relied for the last 50 years. But like seat belts, these devices must be used to be effective. Prevention and detection devices utimately depend on the personnel who operate and maintain them.

The basics for good tank management are found in the applicable regulations and in the operations and maintenance procedures provided by equipment manufactures and installers. A number of videos and publications listed in appendix c are designed to familiarize local employees with UST regulations and with the management of new and upgraded USTs.

Decisions and dollars

Total cost is widely used as a basis for comparing alternatives. When choosing among UST options, local officials will need cost estimates before making a final decision. Developing these figures is a complex task.

Each option offers a different mix of dollars spent, dollars saved and dollars required for potential liability. In addition, these figures vary greatly from community to community, depending on the tanks involved and/or site conditions. In general, these figures should be developed by experts in the field such as engineers, contractors, suppliers and installers.

But decision-making does not take place in a vacuum. It requires the cooperation of public officials who are legally and politically responsible to the community and of UST professionals who provide the details on costs and technology. To be confident in their decision-making, local leaders must understand the professional advice they are given. Chart 4 summarizes the major risk management factors for the options discussed in this guidebook. For each alternative, there is a column listing:

- major cost categories
- range of dollars required
- impact on risk
- potential liability for leaks and spills

Chart 4 is provided as a guide, or map, with which the costs and benefits of one option can be seen in relation to the others. It enables decision-makers, for example, to see that a one time expenditure for groundwater monitoring may be far more cost-effective than annual tightness testing and manual guaging.

While Chart 4 gives an overview for the public official, appendices a and b are designed to give detailed, site-specific information to UST professionals.

There are five major steps in developing a community's UST options:

- complete a survey form for all USTs
- test all tanks not scheduled for closure
- assess costs and liabilities for existing tanks
- assess costs and liabilities for fuel supply alternatives
- compare total costs and risk reduction figures among all available options

Most local governments do not have the capacity on staff to undertake the tasks summarized above. But reading through the tank survey form and other worksheets in appendices a and b can help local leaders see clearly the importance of reducing risk. New or upgraded tanks could add a couple thousand dollars to the annual budget. A leak in an old, unprotected tank could cost 25 times that much in a single year. For many towns, their underground storage tank remains a ticking time bomb. Risk management depends not only on making the right choice, but on making it in time to prevent or control serious damage.

Chart 4

A. UST Compliance and Potential Liability Costs

Compliance Area	Range of Costs
Operating Costs	
Registration and permit fees	$ 25 - 1,000
Operating existing tanks	2,000 - 5,000/year
Upgrading existing tank	
Cathodic protection	2,000 - 4,000
Overfill protection	1,000 - 3,000
Spill prevention	1,000 - 3,000
Release detection	6,000 - 20,000
Replacement	
Installation of state-of-the-art tank	25,000 - 50,000
Closing existing tank	
Closure plan	1,000 - 5,000
Tank excavation and disposal	3,000 - 10,000
Closure report	1,000 - 5,000
Cleanup	
Release verification	500 - 2,000
Decommissioning tank	500 - 2,000
Investigation of small leak or spill	10,000 - 20,000
Investigation of larger leak or spill	25,000 - 50,000
Remediation of small leak or spill	5,000 - 25,000
Remediation of larger leak or spill	25,000 - 125,000
Liability associated with leaks and spills	0 -1,000,000

Chart 4

B. UST Alternative Costs

Option	Potential Costs
Closing Tanks Providing Excess Capacity	Typical costs for closures without leaks are approximately $5,000 to $15,000 per tank. Additional costs might be incurred to investigate or remediate leaks or spills identified during the closure process.
Use of Commercial Supplies	The cost of this alternative includes those resources required for closing existing tanks and the additional costs associated with purchasing product from a commercial supplier. Increased costs are typically 5¢ to 20¢ per gallon.
Use of Alternative Fuels	Typical costs include the costs for closing the unneeded tanks, the capital costs associated with converting vehicles or heating systems to use alternative fuels, any differential fuel costs, etc.
Regionalization of Storage	Costs are largely contingent on the size and capacity design of the regional system. Such costs also include the cost of closing unneeded local USTs.
Privatization of UST Systems	Current costs are approximately $800 to $1,200 per month for a five-year lease for tanks up to 10,000 gallons in size.
Installation of Aboveground Tanks	Current costs are approximately $25,000 to $50,000 for installed aboveground tanks ranging from 2,000 to 10,000 gallons in size.

OPTION	COSTS		LIABILITY				
	Category	Amount	High Risk	Moderate Risk	Low Risk	No Risk	Potential cleanup and damage costs
Manual Compliance	Operating Costs	$2,000-$6000 (Annual)	✔				$0 - $1,000,000
	Manual gauge	$200					
Tank Upgrade	Operating Costs	$2,000-$6000 (Annual)		✔			$0 - $1,000,000
	Upgrade (Equipment and Labor)	$10,000 - $30,000					
Tank Replacement	Operating Costs	$2,000-$6000 (Annual)			✔		$0 - $1,000,000
	Tank Removal	$5,000 - $20,000					
	Replacement (Equip. and labor)	$25,000 - $50,000					
Regionalization	Tank Removal	$5,000 - $20,000			✔		$0 - $1,000,000 (prorated)
	Tank Replacement (prorated)	determined by size and complexity of facility					
	Operating Costs (prorated)						

Chart 4

OPTION	COSTS		LIABILITY				
	Category	Amount	High Risk	Moderate Risk	Low Risk	No Risk	Potential cleanup and damage costs
Privatization	Tank Removal	$5,000 - $20,000				✔	$0 (Leasing company provides liability coverage)
	Annual lease payments for 5 years	$9,000 - $15,000 (annually)					
Aboveground Tanks	Tank Removal	$5,000 - $20,000			✔		$0 - 1,000,000 (Reduced chance of groundwater contamination)
	Tank Installation	$20,000 - $50,000					
Commercial Supplier	Tank Removal	$5,000 - $20,000				✔	$0 (Private supplier carries liability coverage)
	Additional fuel costs						

Chart 4

chapter 5

obtaining help

In solving their UST problems, local leaders must choose a solution that balances compliance, affordability and risk reduction. But along the way, they will need help in dealing with an issue as complex and unfamiliar as USTs.

Different kinds of assistance are required at various stages of the decision-making process. Professional expertise will likely cost money, but there are also many sources of free advice and technical assistance materials. This chapter reviews some of the resources local governments can turn to for help in making the right choice. Final decisions are still in the hands of local elected leaders. But the expertise of others can lead to a clear understanding of the regulations, the problems associated with existing tanks and how various alternatives reduce liability from leaks and spills.

Regulations

Local governments cannot continue to own and operate USTs unless they are in compliance with all applicable regulations. The source of these requirements may be EPA, the state UST regulatory agency or various county or local agencies such as the fire marshall's office. Local decision-makers, must start with an understanding of what is required to stay in the underground storage tank business, and the primary source for this information is the agency responsible for monitoring and enforcing the regulations.

State agencies. Each state designates one or more agencies to implement and enforce UST regulations. A state may develop its own UST requirements, as long as they are at least as strict as the federal standards. Local governments should obtain the regulations which apply to the USTs they own and operate as well as any available technical assistance materials designed for the non-professional. State agencies may be able to provide many of the EPA publications listed in this guidebook which explain the regulations and the technical choices briefly and in plain English.

Unlike many other mandates, the UST regulations allow, and even encourage, more than one way to achieve compliance. Since these standards are tied to goals (corrosion protection, for instance) rather than to a particular technology, there can be a confusing range of choices. Some governments may add or replace only those components which enable them to meet the minimum current compliance standards. But many states have earlier deadlines than those in the federal legislation, and upgrading an older tank may not make sense as either a good investment or as a way to reduce risk. State agency staff may be able to provide good advice regarding short-term versus long-term solutions to community UST problems.

Mandates and regulations are two unpopular words among most small town elected leaders. But in general, environmental agencies view themselves as assistance providers first and enforcement authorities second. All state agencies provide, at no charge, some technical information and advice on how to comply with the regulations. Many agencies also sponsor training workshops or on-site technical assistance covering the range of tank management issues discussed in chapter 3.

Outside help

The regulations can be viewed as the rules of the game. Local governments that want to maintain their own USTs must meet the challenge of achieving compliance. If the cost or risks are too great, local governments may need to consider alternative fuel sources. Most local governments will want to obtain a professional assessment of their tanks and their options before making a decision.

Local government peers. In searching for the right contractor, elected leaders may want to seek the advice of their peers—local officials who have already wrestled with the UST issue and can help identify unexpected problems, reliable contractors and installers, technologies that work, actual costs, insurance sources and so forth. You can locate peer communities that have recently installed tanks or upgraded equipment through the state UST agency, a state local government association or an area UST equipment dealer or installer.

Outside contractors. The consensus among UST professionals is that the most important qualification for an outside consultant is experience. Local officials should learn from all potential UST contractors:

- How long has the firm been in business?
- Does the firm's experience match the community needs? Will the best qualified personnel be performing the work?
- Does the firm have a reputation for good quality work and standing behind its projects?
- Has the firm completed similar projects for other small town or rural clients? Was the work completed on time, within budget and to the clients' satisfaction?
- Does the firm have the financial security to back up the warranties and potential liabilities associated with the contract work?
- Is the firm licensed or certified to do the work under federal, state or local regulations?

Remember that longevity doesn't guarantee the right kind of experience. The new regulations for installation, monitoring and removal, for example have only been in place for a few years. The ability to meet the new requirements within a town's budget constraints is a good indication that a company has both technical skills and environmental know-how. Peer recommendations may be the most reliable way to find the right contractor for your community.

When dealing with UST problems, local governments may contract for a wide range of services and/or equipment. The broad issue areas or tasks requiring outside expertise include site evaluation, tank analysis, design, installation, upgrading, removal, cleanup and closure. These tasks do not all require the same level of skill or technical expertise, so rather than hiring an engineering or consulting firm, some local governments have dealt directly with suppliers and installers who generally do not charge, for recommendations. In bypassing the hiring of a consultant, however, local governments may run the risk of purchasing what is available, not what is best. On the other hand, a local supplier may know as much or more about local site conditions and compliance strategies as an engineer.

Contract services are often subject to state or local bidding procedures, particularly if expensive equipment is involved. When possible, potential contractors should make a systematic presentation of the options for solving a particular problem. They might be ranked from least expensive to most expensive and from minimum to maximum reduction of risk, or you might use other criteria that follow the risk manage-

Mayor Clarence Hawkins of Bastrop, La., says the state regulatory agency helped save the city thousands of dollars by overseeing public employees in the city's cleanup and tank removal efforts. State agencies are also a source of technical assistance materials on regulations, tank systems and good management practices.

Photo courtesy of Bastrop, La.

ment approach for decision-making.

Contracts with all types of assistance providers should include written assurances that the firm:

- carries the necessary insurance for its workers and for potential liability claims;
- is licensed, certified, registered, etc., with the proper authorities for the tasks being performed;
- will use only equipment, parts and materials that meet applicable requirements and that have been specified in the contract;
- will perform all work in accordance with codes, practices, industry standards, manufacturer's recommendations, etc., as required by applicable federal, state or local requirements;
- will dispose of or recycle residues and tank system components in accordance with applicable regulations; and
- will provide disposal agreements, certifications, etc. as evidence such procedures were followed.

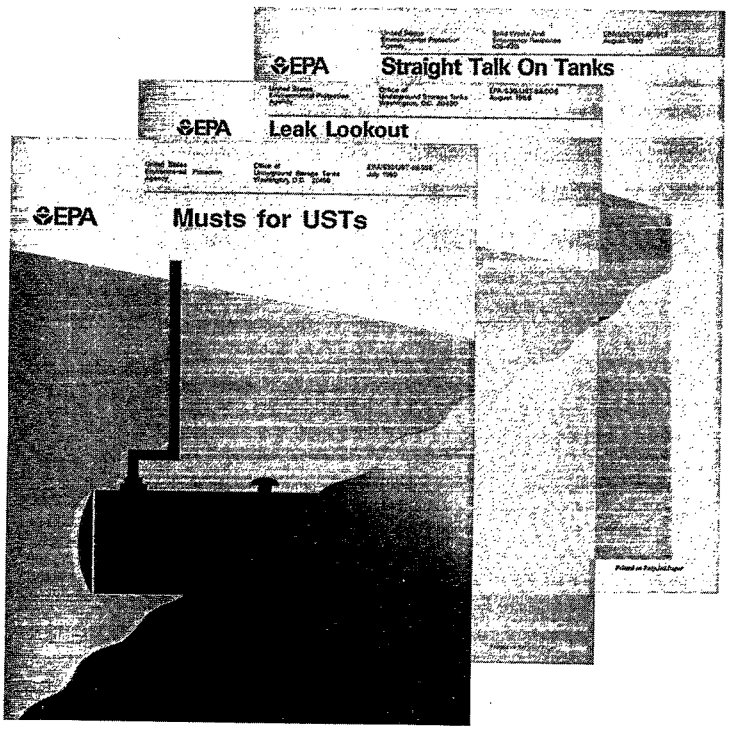
The contract that a local official signs is essentially a delegation of responsibility. He or she must make certain that the written agreement meets all applicable requirements and that work is completed as required before final payment is made. Many of the tasks involving USTs require state or local inspection to assure that the work meets regulatory standards. Absent required inspections, local leaders may want to arrange for review of contract work by an independent professional or qualified volunteer from a neighboring community, county or local business.

Funding options

Owning and operating an underground storage tank is an expensive proposition, even without a leak or spill. Since the new federal and state requirements for USTs were enacted, local governments have been struggling with the additional costs related to owning and operating the tanks themselves and affording the required insurance. The UST requirements are similar to other "unfunded mandates" which require local governments to act, but which provide no dollars to help out. Although no federal funding is provided for new or existing tanks, Congress has established a Leaking Underground Storage Tank (LUST) Trust Fund, available through the states, to help local governments with cleanups or other corrective action for leaks and spills.

The vast majority of local governments, however, will have to cover all costs related to USTs from their own revenues. The risk management approach described in this guidebook can help to minimize, but never eliminate, the money a locality must spend on USTs. Even reliance on an alternative fuel source requires closure and, in many cases, removal of existing tanks.

As we have seen, a number of the UST regulations do not have to be met immediately, or may be met over a period of time. Financing options, then, may center on **when** dollars are available and **how** these dollars are going to be raised.



The U.S. Environmental Protection Agency (EPA) has produced a number of written and video resources for small town elected officials and for their contractors who repair, upgrade or replace existing underground storage tanks. These resources may be available from the state UST agency or may be obtained from EPA itself. Ordering information is provided in appendix c.

Funding sources

User funds have become an increasingly popular method for financing new or unexpected local expenses. Generally, the beneficiaries of a particular service are assigned a proportional amount of the cost.

But underground storage tanks benefit the entire community, and local leaders cannot assign the cost of leaks and spills only to those who live near the facility. User fees would be prohibitive, as well, if the cost of meeting the UST requirements were assigned, for instance, only to the beneficiaries of police, fire and ambulance protection.

Some communities have placed a surcharge on water bills, since groundwater protection is a major objective of the UST regulations. But the fairness question arises again, if only part of the community is served by a public drinking water system.

For small and rural governments, the choices for financing UST systems narrow down, in most cases, to general revenues and bond issues. If a UST system involves only one or two tanks, general revenues may be more cost- effective, when the fixed costs for issuing bonds are considered.

There are options for saving money or attracting outside funds. Blackstone, Va., a town of 3,500, is saving thousands of dollars by helping a licensed installer remove the town's old tanks and install its new tanks. Town Manager Richard Lee says the town owns excavation equipment for water and sewer service and has an experienced work crew. Under state-certified supervision, Blackstone employees are doing much of the work on the $35,000 project. When it is completed, Blackstone will have two 10,000-gallon tanks for gasoline and diesel fuel in a new, environmentally safe site.

Rural fire service requires at least a truck, a station and an underground storage tank, as well as trained and equipped volunteers. Several communities in Utah were able to obtain reconditioned fire trucks from the state surplus agency (each state has one) and use the money saved to pay for other facilities and equipment. Some of these communities even received federal Community Development Block Grant (CDBG) funds, through the state, to construct their fire stations and USTs.

Other communities have contacted their Farmers Home Administration (FmHA) district office about UST funding. Rural communities under 10,000 which have a demonstrated need and no other source of funding may apply to FmHA for the Community Facility Grant and Loan program.

Finally, the federal LUST Trust Fund will raise a total of $1 billion through a 1/10 of one cent per gallon fuel tax. The states may use their share of the fund to conduct cleanups in the following circumstances:

- costs exceed the amount of coverage that tank owners and operators are required to maintain, and fund expenditures are necessary to ensure an effective corrective action;
- a financially solvent owner or operator cannot be found; or
- the owner or operator is unable or unwilling to comply with a cleanup order.

Local governments should contact their state regulatory agency if they believe they qualify for assistance. States have assisted small governments with cleanup costs which exceed the $1,000,000 ceiling on financial responsibility and when repossessed or forfeited property contained USTs needing cleanup, closure or removal.

appendix a

UST survey form

INSTRUCTIONS FOR APPENDIX A SURVEY FORM

The intent of this survey is to facilitate the collection of that information most relevant to assessing the potential liabilities associated with existing underground storage tanks. To the extent possible, the survey form has been designed to be as self-explanatory as possible. Additional guidance, where potentially relevant, is provided below:

Question	Supplemental Guidance
1	Identify total number of underground storage tanks either owned or operated by the town or township in question. Do not include tanks not owned or operated by the town or township.
2	To the extent possible, identify all past uses of the property (industrial, commercial, agricultural, vacant, residential, etc.) and the time periods related to each use. Identify any previously closed tanks and methods of closure. Identify any other tanks, including all aboveground tanks. Identify any other materials previously stored in all tanks and relevant time periods. Refer to engineering drawings or specifications if possible to identify tank and piping features. Attach latest tank or piping testing, monitoring or leak detection results.
3	Describe any known leaks or spills to the maximum extent possible. Attach copies of any documentation that describes past leaks or spills.
4	Describe extent of any known remedial efforts to maximum extent possible. Attach copies of any available documentation.
5	Provide any other information which relates to any unusual liabilities which might be incurred as a result of operating, upgrading, replacing or closing each tank.

1. GENERAL INFORMATION

Name of Town or Township : _____

Address : _____

Total Number of Underground Tanks Owned/Operated : _____

2. TANK AND SITE SPECIFIC INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Underground tank registration number					
Tank location (address)					
Present use of property (describe)					
Past use of property (describe)					
Property ownership (owned/leased)					
Any previously closed underground tanks at this location (describe)					
Any other tanks at this location (describe)					
Tank size (gallons)					
Installation date (mo/yr)					
Tank new when installed (yes/no) if no, specify age at installation					
Tank installed by state or manufacturer-certified installer (yes/no)					
Tank precision-tested after installation (yes/no)					
Tank closed as per applicable state or federal law (yes/no)					

2. TANK AND SITE SPECIFIC INFORMATION (continued)

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Materials Currently Stored in Tank (yes/no)					
Leaded gasoline					
Unleaded gasoline					
Diesel					
Heating oil					
Kerosene					
Waste oil					
Other (specify) _____					
Average monthly throughput per tank (gallons)					
Tank Construction (yes/no)					
Bare steel					
Coated steel					
Fiberglass					
Steel/fiberglass composite					
Double-walled steel					
Double walled fiberglass					
Other (specify)_____ _____					

2. TANK AND SITE SPECIFIC INFORMATION (continued)

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Tank Features (yes/no)					
Spill collection device					
Overfill protection device					
Sacrificial anode					
Impressed current					
Secondary containment (specify) _____					
Other (specify) _____					
Piping/Dispensing System (yes/no)					
Steel					
Plastic					
Fiberglass					
Double-Walled					
Pressurized					
Suction					
Other (specify) _____					
Piping/Dispensing Features (yes/no)					
Pressurized piping					
Automatic shut-off					
Sacrificial anode					
Impressed current					
Secondary containment (specify) _____					

2. TANK AND SITE SPECIFIC INFORMATION (continued)

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Piping/Dispensing Features (continued) Other (specify) _____ _____					
Tank Leak/Spill Monitoring (N= none, C = continuous, D = daily, W = weekly, M = monthly, A = annually) Manual inventory control					
Automatic inventory control					
Interstitial monitoring					
Vapor Monitoring					
Groundwater monitoring					
Precision testing					
Piping Leak/Spill Monitoring (N= none, C = continuous, D = daily, W = weekly, M = monthly, A = annually) Interstitial monitoring					
Vapor monitoring					
Groundwater Monitoring					
Precision testing					
Environmental Factors Type of soil (sand, clay, etc.)					
Depth to groundwater (feet)					
Tank located in flood plain (yes/no)					
Tank located in wetlands (yes/no)					

SUPPLEMENTAL UNDERGROUND STORAGE TANK SURVEY FORM (continued)

2. TANK AND SITE SPECIFIC INFORMATION (continued)

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Distance to Nearest (feet)					
Surface water					
Public water supply					
Private well					
Residence					
Other (specify) ___ _____ _____					

3. EVIDENCE OF PAST LEAKS OR SPILLS (yes/no) (if yes, describe in detail)

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Any known spills or leaks					
Inventory reconciliation discrepancies					
Tank Tightness or Precision Testing					
Vapor or groundwater monitoring					
Erratic dispensing equipment					
Water in tank					
Visual evidence					
Odors					
Other (specify) _____					

SUPPLEMENTAL UNDERGROUND STORAGE TANK SURVEY FORM (continued)

4. DESCRIBE EXTENT OF SOIL OR GROUNDWATER REMEDIATION

5. ANY OTHER FACTS, CIRCUMSTANCES OR SITUATIONS WHICH COULD LEAD TO ANY OTHER UNUSUAL LIABILITIES? (If yes, describe in detail)

6. SURVEY FORM COMPLETED BY:

Name:_____ Title:_____ Date:_____ Phone:_____

appendix b

worksheets

INSTRUCTIONS FOR APPENDIX B

The intent of these worksheets is to help local officials evaluate the potential liabilities associated with continuing to operate existing underground tanks and to assess the costs associated with alternative risk management approaches. The worksheets are designed to be as self-explanatory as possible. While the use of engineering judgement is required to respond to some of the worksheet questions, much of the required information should result from completion of the survey form contained in appendix a and Chart 4 in chapter 4.

Step	Supplemental Guidance
1A	From survey form.
1B	From survey form.
1C	Local officials should review survey form to ascertain that all questions have responses that appear to be reasonably accurate.
1D	From questions 3, 4 and 5 on the survey form.
2A	In some instances, inaccurate inventory control records or tank tests may falsely indicate tank leakage. The available data should be reviewed to assess whether or not tanks potentially identified as leaking actually are likely to be leaking. In some cases, additional data review and/or tank testing may be required to resolve uncertainties.
2B	Typically over the next two or three months.
2C	Tank testing may not be required for tanks already known to be leaking or scheduled for closure over the near term.
2D	Indicate whether tanks tested positively (leaking) or negatively (non-leaking).
2E	Local official should refer to locale-specific notification requirements.
2F	Describe in detail any such activities. Attach relevant documentation if available, including all estimated costs.
3A	Local officials should review applicable local, state and/or federal regulations to ascertain registration and permit fees. Since such fees are mandated by regulation, the response to "Estimated Potential Liability" will be identical to that for "Estimated Cost."
3B	Local officials should review the costs outlined in Chart 4 of chapter 4. If specific values are not known, a mid-range value (such as $6,000 per year) should be selected.
3C	If specific closure costs are not known, a mid-range value (such as $7,500) should be used.

3D Unless specific design decision and vendor quotes have been obtained, local officials should use a mid-range value (such as $35,000) for installation of replacement tanks.

3E Unless specific design decisions and vendor quotes have been obtained, local officials should use a mid-range value (such as $15,000) for upgrading existing tanks.

3F If detailed cost estimates are not available, local officials should use a mid-range value (such as $50,000) for investigation and remediation of known leaks and spills.

3G Local officials should use a mid-range value (such as $50,000) for investigation and remediation of future leaks and spills and an estimated probability of occurrence of 50% for leaks and spills from replaced tanks.

3H Local officials should use a mid-range value (such as $50,000) for investigation and remediation of future leaks and spills and an estimated probability of occurrence of 10% for leaks and spills from upgraded tanks.

3I Local officials should enter zero for "Estimated Costs" and "Probability of Occurrence," unless property damage or health damages have been alleged. In such cases, legal assistance should be obtained to assess the potential liabilities.

3J Total all estimated liabilities for Steps 3A through 3I utilizing the results of Steps 3D and 3G for tanks to be replaced and steps 3E and 3H for tanks to be upgraded.

4A For all potentially viable risk management options, local officials should estimate total capital and operating costs, assuming a 20-year life. Since these costs are highly site-specific, local officials will likely need to seek additional information beyond that contained in Chart 4.

4B For each tank, the least costly alternative should be identified. To this cost should be added the closure costs identified in Step 3C.

5A Local officials should compare the total libilities from Steps 3J and 4B on a tank-by-tank basis.

5B The least-cost alternative should be identified in Step 3D.

6A Local officials should identify those tanks for which upgrading or replacement appears to represent a least-cost approach or for which operational considerations mandate continued operation.

6B The lowest total cost option should be re-verified by re-completing Worksheet C, utilizing actual vendor quotes for Steps 3D and 3E.

6C The least-cost option should be selected.

APPENDIX B

WORKSHEET A

Step 1: Complete Supplemental Survey

Step 1A	Tank #	Location	Product	Size
Identify all existing underground tanks including inactive tanks or tanks closed not in accordance with applicable regulations:	1			
	2			
	3			
	4			
	etc.			

Step 1B	Tank #	Yes/No	Registration Number
Has tank been registered with appropriate local, state and/or federal agency:	1		
	2		
	3		
	4		
	etc.		

Step 1C	Tank #	Yes/No
Have survey forms been received for all tanks in Step 1A, and are survey forms complete and apparently accurate?	1	
	2	
	3	
	4	
	etc.	

Step 1D	Tank #	Yes/No
Does any evidence exist that leaks or spills have occurred from any of the tanks identified in Step 1A:	1	
	2	
	3	
	4	
	etc.	

APPENDIX B

WORKSHEET B

Step 2: Implement Tank-testing Program

Step 2A

Is evidence clear that any of the tanks tentatively identified as leaking in Step 1D are leaking:

Tank #	Yes/No
1	
2	
3	
4	
etc.	

Step 2B

Are any of the tanks scheduled for closure in the near term:

Tank #	Yes/No
1	
2	
3	
4	
etc.	

Step 2C

Have tank-testing vendors been contacted to determine suitability of test methods and estimated costs for testing all tanks identified in Step 1A but excluding 2A and 2B :

Tank #	Yes/No	Estimated Cost
1		
2		
3		
4		
etc.		

Step 2D

Have tests been completed and results received:

Tank #	Yes/No	Test Results
1		
2		
3		
4		
etc.		

Step 2E

Has appropriate local or state agency been notified of any identified leaks as per Steps 2A and 2D:

Tank #	Yes/No
1	
2	
3	
4	
etc.	

APPENDIX B

WORKSHEET B (continued)

Step 2F	Tank #	Yes/No	Nature of Action
Have appropriate investigations, repairs and/or corrective actions been initiated for tanks identified as leaking in Steps 2A and 2D:	1	_____	_____
	2	_____	_____
	3	_____	_____
	4	_____	_____
	etc.	_____	_____

APPENDIX B

WORKSHEET C

Step 3: Assess Magnitude and Probability of Potential Liabilities Associated with Underground Tank Installations

Step 3A	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify potential registration/ permit fees for all USTs identified in Step 1A:	1		100%	
	2		100%	
	3		100%	
	4		100%	
	etc.		100%	

Step 3B	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify potential operating costs and financial responsibility costs for each tank identified in Step 1A assuming 20-year life:	1		100%	
	2		100%	
	3		100%	
	4		100%	
	etc.		100%	

Step 3C	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs for future closure of all USTs identified in Step 1A:	1		100%	
	2		100%	
	3		100%	
	4		100%	
	etc.		100%	

Step 3D	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs for replacing all tanks identified in Step 1A, excluding tanks identified in Step 2B:	1		100%	
	2		100%	
	3		100%	
	4		100%	
	etc.		100%	

APPENDIX B

WORKSHEET C (continued)

Step 3E	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs to upgrade all tanks identified in Step 1A, excluding tanks identified in Step 2B:	1	_____	100%	_____
	2	_____	100%	_____
	3	_____	100%	_____
	4	_____	100%	_____
	etc.	_____	100%	_____

Step 3F	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs to investigate and remediate tanks with currently known leaks as identified in Steps 2A and 2D:	1	_____	100%	_____
	2	_____	100%	_____
	3	_____	100%	_____
	4	_____	100%	_____
	etc.	_____	100%	_____

Step 3G	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs for responding to potential future leaks for all remaining tanks which are to be replaced:	1	_____	____	_____
	2	_____	____	_____
	3	_____	____	_____
	4	_____	____	_____
	etc.	_____	____	_____

Step 3H	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs for responding to potential future leaks for all remaining tanks which are to be upgraded:	1	_____	____	_____
	2	_____	____	_____
	3	_____	____	_____
	4	_____	____	_____
	etc.	_____	____	_____

APPENDIX B

WORKSHEET C (continued)

Step 3I	Tank #	Estimated Cost	Probability of Occurrence	Estimated Potential Liability (cost x probability)
Identify estimated costs for known or potential tort actions:	1			
	2			
	3			
	4			
	etc.			

Step 3J	Tank #	Total Estimated Potential Liabilities for Replacement Option	Total Estimated Potential Liabilities for Upgrading Option
Total estimated costs for Step 3A through 3I:	1		
	2		
	3		
	4		
	etc.		

WORKSHEET D

Step 4: Evaluating Alternative Risk Management Options

Step 4A	Tank # 1	2	3	4	5
Identify Estimated Costs for Potentially Suitable Risk Management Options					
Closing tank due to excess capacity					
Use of commercial supplies					
Use of alternative fuels					
Regionalization					
Privatization/lease arrangements					
Aboveground Tank					

Step 4B	Tank #	Tentatively Selected Risk Management Option	Estimated Cost Implementing Option	Estimated Cost for for Closing Tank	Total Estimated Cost
Identify estimated costs for implementing most suitable risk management option:	1				
	2				
	3				
	4				
	etc.				

APPENDIX B

WORKSHEET E

Step 5: Compare Liabilities Associated With Implementing Risk Management Options Versus Operating Existing Tank Installations

Step 5A	Tank #	Estimated Potential Liability for Existing Tank from 3J	Total Estimated Cost for Implementing Risk Management Option from 4B
Compare liabilities associated with most suitable risk management option versus continuing to operate existing tank system:	1		
	2		
	3		
	4		
	etc.		

Step 5B	Tank #	Recommended Approach
Identify lowest cost option for each tank:	1	
	2	
	3	
	4	
	etc.	

APPENDIX B

WORKSHEET F

Step 6: Finalizing Upgrading or Replacement Options For Remaining Tanks

Step 6A	Tank #	Yes/No
Identify remaining tanks requiring upgrading or replacement from Step 5B:	1	
	2	
	3	
	4	
	etc.	

Step 6B	Tank #	Estimated Replacement Costs	Estimated Upgrading Costs
Have consultants or vendors been contacted to determine most appropriate replacement or upgrading methods and costs for tanks identified in Step 6A:	1		
	2		
	3		
	4		
	etc.		

Step 6C	Tank #	Recommended Approach
Identify lowest cost option from Step 6B:	1	
	2	
	3	
	4	
	etc.	

appendix c

selected resources

Technical Resources

1.	*Digest of Six API Recommended Practices on Underground Petroleum Storage Tank Management, First Edition, 1989.* Order no. 804-16500. $65.00	Am. Petroleum Institute Publications and Distribution 1220 L Street N.W. Washington, DC 20005 (202) 682-8375
2.	*Video/Recommended Practices Package on Tank Management.* Order no. 804-16620. $80.00	Same as above
3.	*Removal and Disposal of Used Underground Petroleum Storage Tanks, Second Edition, 1987.* (Nine pages) Order no. 804-16040. $12.00	Same as above
4.	*Installation of Underground Petroleum Product Storage Systems, Fourth Edition, 1987.* (16 pages) Order no. 804-16150. $12.00	Same as above
5.	*A Guide to the Assessment and Remediation of Underground Petroleum Releases, Second Edition, 1989.* (81 pages) Order no. 804-16280. $16.00	Same as above
6.	*Interior Lining of Underground Storage Tanks, Second Edition, 1987.* (Nine pages) Order no. 804-16310. $12.00	Same as above
7.	*Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems, Second Edition, 1987.* (12 pages) Order no. 804-16320. $12.00	Same as above

8.	Video—*Doing It Right, Proper Installation of Underground Storage Systems.* (41 minutes) Order no. 804-16600. $16.00	Same as above
9.	*Cleanup of Releases from Petroleum USTs: Selected Technologies.* Stock no. 055-000-00272-0. $7.50	Superintendent of Documents U.S. Government Printing Office Washington, DC 20402 (202) 783-3238
10.	*Field Measurements: Dependable Data When You Need It.* Stock no. 055-00368-8. $5.50	Same as above
11.	*Petroleum Tank Releases Under Control: A Compendium of Current Practices for State UST Inspectors.* Stock no. 055-000-00295-9. $8.50	Same as above
12.	*Processes Affecting Subsurface Transport of Leaking Underground Tank Fluids.* Stock no. 055-000-00269-0. $3.25	Same as above
13.	*Survey of Vendors of External Petroleum Leak Monitoring Devices for Use with USTs.* Stock no. 055-000-00277-1. $4.25	Same as above
14.	Video—*Tank Closure Without Tears: An Inspector's Safety Guide.* Video and booklet $35.00	New England Interstate Water Pollution Control Commission Attn: VIDEOS 85 Merrimac Street Boston, MA 02114
15.	Video—*What Do We Have Here? An Inspector's Guide to Site Assessment at Tank Closure.* Video and booklet $45.00	Same as above

Resources for Local Officials

1.	*Getting Out from Under, underground storage tank alternatives for small towns.* Guidebook only—NATaT members, $6.00, others, $11.00. Training module, including guidebook, video and facilitator's guide—rental, members, $25.00, others $45.00; purchase, members, $50.00, others, $80.00	National Association of Towns and Townships 1522 K Streeet, N.W. Washington, D.C. 20005 (202) 737-5200
2.	*Dollars and Sense — A Summary of the Financial Responsibility Regulations for Underground Storage Tank Systems.* Stock No. 055-000-00293-2. $1.25	Superintendent of Documents U.S. Government Printing Office Washington, DC 20402 (202) 783-3238
3.	*Musts for USTs — A Summary of the Regulations. for Underground Storage Tank Systems.* Stock No. 055-000-00294-1. $2.50	Same as above
4.	*Survey of Vendors of External Petroleum Leak Monitoring Devices for Use with USTs.* Stock No. 055-000-00277-1. $4.25	Same as above
5.	*Leak Lookout — Using External Leak Detectors to Prevent Petroleum Contamination from Underground Storage Tanks.* Free	U.S. EPA Office of Underground Storage Tanks P.O. Box 6044 Rockville, MD 20850
6.	*Oh No! — Petroleum Leaks and Spills: What Do You Do?* Free	Same as above
7.	*Straight Talk on Tanks — A Summary of Leak Detection Methods for Petroleum Underground Storage Tank Systems.* Free	Same as above
8.	*1991 Directory of Consultants Who Provide Services Associated with Preliminary Site Assessments and Underground Storage Tanks.* $1.00	ASFE 8811 Colesville Rd. Suite G 106 Silver Spring, MD 20910
9.	Video—*Straight Talk on Leak Detection.* $40.00	Environmental Media Center P.O. Box 30212 Bethesda, MD 20814 (800) 522-0362
10.	Video—*In Your Own Backyard — What Tank Owners Should Require from Installation Contractors.* $32.85	TZ Communications P.O. Box 332 Holbrook, MA 02343
11.	*Underground Tank Technology Update.* Bimonthly newsletter on issues related to groundwater technology. Free	Philip O'Leary Project Director 432 N. Lake St. Madison, WI 53706

Missouri
Department of Natural Resources
Laboratory Services Program
2100 Missouri Blvd.
Jefferson City, MO 65102
(314) 751-7929

Mississippi
Department of Natural Resources
Bureau of Pollution Control
Underground Storage Tank Section
P.O. Box 10385
2380 Highway 80 West
Jackson, MS 39209
(601) 961-5171

Montana
Solid and Hazardous Waste Bureau
Department of Health and Environmental Science
836 Front Street
Helena, MT 59620
(406) 444-5970

North Carolina
Division of Environmental Management
Division of Environmental Mgmt.
Department of Natural Resources
441 North Harrington Street
Raleigh, NC 27603
(919) 733-8486

North Dakota
Division of Waste Management
Department of Health
1200 Missouri Avenue
Bismarck, ND 58502-5520
(701) 221-5166

Nebraska
State Fire Marshal
Underground Storage Tank Division
246 South 14th Street
Lincoln, NE 68508
(402) 471-9465

New Hampshire
Department of Environmental Services
Water Supply and Pollution Control Division
Hazen Drive, P.O. Box 95
Concord, NH 03301
(603) 271-3644

New Jersey
Department of Environmental Protection
Division of Water Resources (CN-029)
Trenton, NJ 08625
(609) 984-3156

New Mexico
Underground Storage Tank Section (Room N. 2150)
Environmental Improvement Division
H.W. Bureau
1190 St. Francis Drive
Santa Fe, NM 87502
(505) 827-0188

Nevada
Division of Environmental Protection
Department of Conservation and
Natural Resources
Capitol Complex 123 West Nye Lane
Carson City, NV 89710
(702) 687-5872

New York
Bulk Storage Section, Division of Water
Department of Environmental Conservation
50 Wolf Road, Room 326
Albany, NY 12233-3520
(518) 457-4351

Ohio
State Fire Marshal's Office
Department of Commerce
7510 E. Main Street
Reynoldsburg, OH 43068-3395
(614) 752-7938
(800) 282-1927

Oklahoma
Corporation Commission
Underground Storage Tank
Jim Thorpe Building
Oklahoma City, OK 73105
(405) 521-3107

Oregon
Department of Environmental Quality
811 SW Sixth Avenue, 7th Floor
Portland, OR 97204
(503) 229-5733

Pennsylvania
Department of Environmental Resources
Bureau of Water Quality Management
Storage Tank Program
3600 Vartan Way, 2nd Floor
Harrisburg, PA 17105-8762
(717) 657-4080

Rhode Island
Underground Storage Tank Section
Department of Environmental Management
291 Promenade Street
Providence, RI 02908
(401) 277-2234

South Carolina
Groundwater Protection Division
Department of Health and Environmental Control
Dept. N
2600 Bull Street
Columbia, SC 29201
(803) 734-5332

South Dakota
Office of Water Quality
Department of Water and Natural Resources
Joe Foss Building, Room 217
Pierre, SD 57501-3181
(605) 773-3351

Tennessee
Division of Groundwater Protection
Department of Environment and Conservation
200 Doctors Bldg.
706 Church Street
Nashville, TN 37247-4101
(615) 741-4081

Texas
Petroleum Storage Tank Division
Water Commission
P.O. Box 13087; 1700 North Congress
Austin, TX 78711
(512) 317-6200

Utah
Bureau of Solid and Hazardous Waste
Department of Environmental Health
P.O. Box 16700
Salt Lake City, UT 84116-0700
(801) 538-6338

Virginia
Water Control Board
2111 North Hamilton Street
P.O. Box 11143
Richmond, VA 23230-1143
(804) 367-6685

Vermont
Department of Environmental Conservation
Waste Management Division
103 South Main Street, West Bldg.
Waterbury, VT 05676
(802) 244-8702

Washington
Department of Ecology, M/S PV-11
Solid and Hazardous Waste Program
Olympia, WA 98504-8711
(206) 459-6272

Wisconsin
Department of Industry, Labor and Human Relations
P.O. Box 7979
201 East Washington Ave.
Madison, WI 53707-7969
(608) 267-9725

West Virginia
Division of Waste Management
Department of Natural Resources
Underground Storage Tank Office
1356 Hansford Street
Charleston, WV 25301
(304) 348-6371

Wyoming
Water Quality Division
Department of Environmental Quality
Herschler Building, 4th Floor West
122 West 25th Street
Cheyenne, WY 82002
(307) 777-7781

American Somoa
Environmental Quality Commission
Office of the Governor
American Samoan Government
Pago Pago, American Samoa 96799
(684) 633-2682

Guam
Environmental Protection Agency
Harman Plaza, Complex Unit D-107
130 Rojas Street
Agana, Guam 96911
(671) 646-8863

Northern Mariana Islands
Division of Environmental Quality
P.O. Box 1304
Commonwealth of Northern Mariana Islands
Saipan, CM 96950
(607) 234-6984

Puerto Rico
Water Quality Control Area
Environmental Quality Board
P.O. Box 11488
Commonwealth of Puerto Rico
Santurce, Puerto Rico 00910
(809) 725-8410

Virgin Islands
Environmental Protection Division
Department of Planning and National Resources
213, Nicky Center
Charlotte Amalie, St. Thomas,
Virgin Islands 00802
(809) 774-3320

NATaT and the National Center for Small Communities

The purpose of the National Association of Towns and Townships (NATaT) is to strengthen the effectiveness of towns, townships and small communities and to promote their interests in the public and private sectors.

NATaT is a non-profit membership organization offering a wide variety of technical assistance, educational services and public policy support to local government officials from more than 13,000 towns, townships and other small communities throughout the United States.

Developing effective federal policy

Through its National Center for Small Communities (NCSC), NATaT conducts research and develops public policy recommendations that are scaled to the unique needs and nature of rural governments and small towns. By analyzing federal and state initiatives and disseminating information about them, NATaT and NCSC keep local officials abreast of decisions and actions of national import, so they can better manage change in their communities.

Education and information

NATaT's educational conferences, training, workshops, specialized publications and audio-visual resources help small town officials cope with change in their communities and improve the quality of life for rural people. The association's annual educational conference for small town officials, America's Town Meeting, is the largest such gathering in the nation and focuses on federal programs and policies that affect small communities.

The association's monthly news journal, *NATaT's Reporter*, is the only national source of intergovernmental policy news and "how-to" information written exclusively for small town officials. Topics covered in the *Reporter* range from community and economic development to federal transportation and environmental policies to solid waste management.

Other "how-to" publications cover recycling, construction of wastewater treatment facilities, planning for hazardous materials response and more.

For a copy of our free information brochure and resources listing, please contact the National Association of Towns and Townships, 1522 K Street, N.W., Washington, D.C. 20005, or call (202) 737-5200.